

**DEVELOPING A VALIDATED FRAMEWORK FOR A PATIENT BLOOD MANAGEMENT
(PBM) TOOLKIT APPROPRIATE FOR THE SOUTH AFRICAN HEALTHCARE CONTEXT**

VANITHA RAMBIRITCH

(Student Number: RMBVAN001)

Thesis presented for the degree of DOCTOR OF PHILOSOPHY (PhD) in the Department of
Medicine, Faculty of Health Sciences, University of Cape Town

Supervisor: Professor Vernon J. Louw

Division of Clinical Haematology, Department of Medicine, University of Cape Town,
South Africa

Co-Supervisor: Professor Estelle Verburgh

Division of Clinical Haematology, Department of Medicine, University of Cape Town,
South Africa

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Signed by candidate

DEDICATION

I dedicate this thesis to my late mum, Ms Bhagwanthi Sithalram, and mum-in-law, Ms Gythree Ramsoonder, who were the inspiration for my study. Their love, encouragement, and belief in me carried me through this journey.

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ABSTRACT

Patient blood management (PBM) is a patient-centred, systematic, evidence-based approach to improve patient outcomes by managing and preserving a patient's own blood while promoting patient safety and empowerment. The historic inappropriate use of risk-associated blood transfusions in treating anaemia and blood loss needs to be replaced by evidence-based PBM practices. This study was aimed at developing a validated framework of cost-effective, feasible, evidence-based PBM measures to guide the development of a toolkit that can support PBM implementation in hospitals and assist clinicians in optimising the care of patients and minimising inappropriate blood transfusions.

A mixed-methods research design was applied. One-on-one semi-structured interviews with PBM champion participants in the qualitative phase provided insight into the challenges and barriers to PBM implementation in South Africa, and the educational and clinical practice guiding tools needed to support implementation. The thematically analysed data from the literature and the interviews were used to develop statements that were subsequently rated by a panel of PBM experts in a three-round Delphi survey in the semi-quantitative phase of the study. Consensus was gained on the tools deemed essential for primary, secondary, and tertiary-level hospitals in South Africa, including the educational needs and overall barriers that need to be addressed.

The findings revealed four broad categories of tools: (i) definitional tools to contextualise PBM and frame the importance of its implementation in South Africa; (ii) policy and procedural tools to guide evidence-based clinical practices taking into account resource and infrastructure capabilities in the various levels of hospitals; (iii) education and training tools directed at bridging PBM educational gaps among doctors, nurses, healthcare leadership stakeholders, and patients; and (iv) planning, assessment and evaluation tools to assist hospitals with planning, and implementing PBM interventions.

The framework for a PBM toolkit as the outcome of this research contributes significant value by proposing an actionable, evidence-based model that adapts international PBM principles to resource-limited settings, promoting safer and more effective patient care while minimising inappropriate blood transfusions. Education supported by the right mix of clinical practice guiding tools informed by the PBM toolkit framework can make PBM implementation possible in South Africa and beyond.

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LIST OF ABBREVIATIONS AND ACRONYMS

AIDS	Acquired immune deficiency syndrome
AMR	Antimicrobial resistance
ART	Antiretroviral therapy
CalSWEC	California Social Work Education Centre
cART	Combined antiretroviral therapy
COVID-19	Coronavirus disease
DAT	Direct antiglobulin test
DHS	District Health System
DoH	Department of Health
EBP	Evidence-based practice
FFP	Fresh-frozen plasma
GPs	General practitioners
HAART	Highly active antiretroviral therapy
Hb	Haemoglobin
HBV	Hepatitis B virus
HCV	Hepatitis C virus
HIC	High-income country
HIV	Human Immunodeficiency Virus
HMB	Heavy menstrual bleeding
HTC	Hospital transfusion committee
ICU	Intensive care unit
ID	Iron deficiency
IDA	Iron deficiency anaemia
ID-NAT	Individual donation nucleic acid testing

IFPBM	International Foundation for Patient Blood Management
IV	Intravenous
LMIC	Low- and middle-income country
MeSH	Medical Subject Headings
NAID	Non-anaemic iron deficiency
NHS	National Health Service
NLM	National Library of Medicine
PBM	Patient blood management
PHC	Primary healthcare
PLHIV	Patients living with HIV
POC	Point of care
POCT	Point-of-care testing
PPH	Postpartum haemorrhage
RBC	Red blood cell
ROTEM	Rotational thromboelastometry
SA	South Africa
SABM	Society for the Advancement of Blood Management
SOPs	Standard operating procedures
SSA	Sub-Saharan Africa
SANBS	South African National Blood Service
TEG	Thromboelastography
TRALI	Transfusion-related acute lung injury
UFS	University of the Free State
UK	United Kingdom
USA	United States of America
WCBS	Western Cape Blood Service
WHO	World Health Organization

CHAPTER 1: ORIENTATION TO THE STUDY

1.1 INTRODUCTION

“Blood transfusion is like marriage: it should not be entered upon lightly, unadvisedly or wantonly, or more often than is absolutely necessary.”¹ Although lifesaving in certain circumstances, blood transfusions expose patients to infectious disease risks and potentially lethal non-infectious reactions.^{2,3} In addition to the ongoing global concerns about blood safety, countries like South Africa (SA) and other low-and middle-income countries (LMICs) face the twin challenges of the high demand for blood and inadequate supplies.⁴⁻⁷ In sub-Saharan Africa (SSA), these challenges are magnified by the high prevalence of anaemia, infectious diseases such as human immune deficiency virus (HIV), non-infectious diseases, obstetric haemorrhage, and a variety of other factors.⁸⁻¹³

Globally, the anaemia disease burden is a major health concern affecting more than a quarter of the world’s population; this has widespread social, economic, and healthcare implications.¹⁴⁻¹⁶ Nutritional deficiencies, most commonly iron deficiency (ID), attributed mainly to poor diet, helminthic and other infections, as well as heavy menstrual bleeding, are common causes.¹⁵ In most but not all cases, nutritional causes of anaemia can be corrected with IV or oral iron, B12, or folate supplementation, which are cost-effective and generally efficient low-risk treatment modalities.

The problem that exists is that anaemia is often not considered a clinically significant condition; it remains unnoticed and therefore goes uncorrected in many patients.¹⁷ It is sometimes only detected in surgical situations, in the emergency room, when patients have symptoms as a sign of specific diseases, or as an incidental finding. In contrast, when anaemia is detected, rather than identifying and treating the underlying causes, clinicians often habitually administer blood transfusions to correct “low” levels of haemoglobin (Hb).¹⁸

For decades, red blood cell (RBC) transfusions have been – and still are – the default treatment for anaemia and blood loss in many settings.¹⁸⁻²⁰ Although a large body of evidence shows that anaemia, blood loss, and transfusion are independent risk factors for adverse patient outcomes, including morbidity, mortality, and average length of hospital stay, transfusions remain an overused therapeutic procedure.^{17,19-24} Furthermore, varying perceptions of ‘low’ Hb levels among clinicians and whether the clinical circumstances warrant the need for blood transfusions contribute to wide variations in transfusion practices.²⁵⁻²⁷

The fundamental principle is that blood transfusion should only be administered when there is a clear clinical indication for its need and when no other reasonable alternatives are available.

Factors contributing to the overuse and inappropriate use of blood including variations in transfusion practices include the lack of clinician knowledge on evidence-based approaches to managing anaemia, lack of education on good clinical transfusion practices, and lack of guiding tools to inform best practice standards.²⁸⁻³⁵ These deficiencies warrant concern as they affect patient outcomes and add to healthcare costs.^{6,19,27,36,37} Furthermore, they exert strain on clinical services and blood services, adding to the blood demand-supply challenges; hence the call for solutions across the globe.^{11,38}

Collecting more donor blood is not the primary solution. What is needed is reconsideration of the approach to managing patients with anaemia and bleeding with the aim of preserving the blood of patients while simultaneously stewarding the blood of donors in a responsible manner.³⁸ These practices represent essential healthcare imperatives, justifying the need for clinicians to prioritise doing what is right and best for patients, rather than increasing access to more allogeneic blood. Historically, efforts at a global level have been directed at collecting more blood and improving blood and blood product safety. This is indeed important as is the safety and optimal care of patients.

In recent years transitions in practice have been noted. The benefits of redirecting focus away from the historic “blood is always good” philosophy and prioritising individual patient needs by appropriately treating underlying conditions rather than defaulting to transfusions, are increasingly being recognised and advocated.^{17,21-24,39} Multiple studies have shown that this patient-centred care approach, referred to as patient blood management (PBM), first and foremost improves clinical outcomes of patients, and in doing so reduces healthcare costs and avoids inappropriate transfusions.⁴⁰⁻⁴³

PBM is “a patient-centred, systematic, evidence-based approach to improve patient outcomes by managing and preserving a patient's own blood, while promoting patient safety and empowerment.”⁴⁴ This is achieved by pre-emptively diagnosing and correcting anaemia and limiting blood loss by cell salvage, coagulation optimisation and other measures.^{18,45,46} PBM, endorsed by the World Health Organization (WHO) in 2010, is an evidence-based standard of care rooted within a paradigm of patient safety and empowerment.⁴⁷ It is not an intervention nor an alternative to allogeneic blood transfusions, however, a reduction in the use of blood transfusions is an outcome of applying PBM principles of care.¹⁸

PBM's central tenet is the use of every appropriate measure to protect and manage a patient's own blood in a manner that is tailored to the needs of individual patients. The underlying principles are known as the “three pillars of PBM.”^{16,48} The successful adoption of the PBM pillars can be achieved by establishing institutionally empowered multidisciplinary healthcare teams working together to implement these fundamental pillars.

Figure 1 below, from the 2021 WHO Policy Brief: The urgent need to implement patient blood management, presents the three pillars of PBM.¹⁶

Three pillars of patient blood management

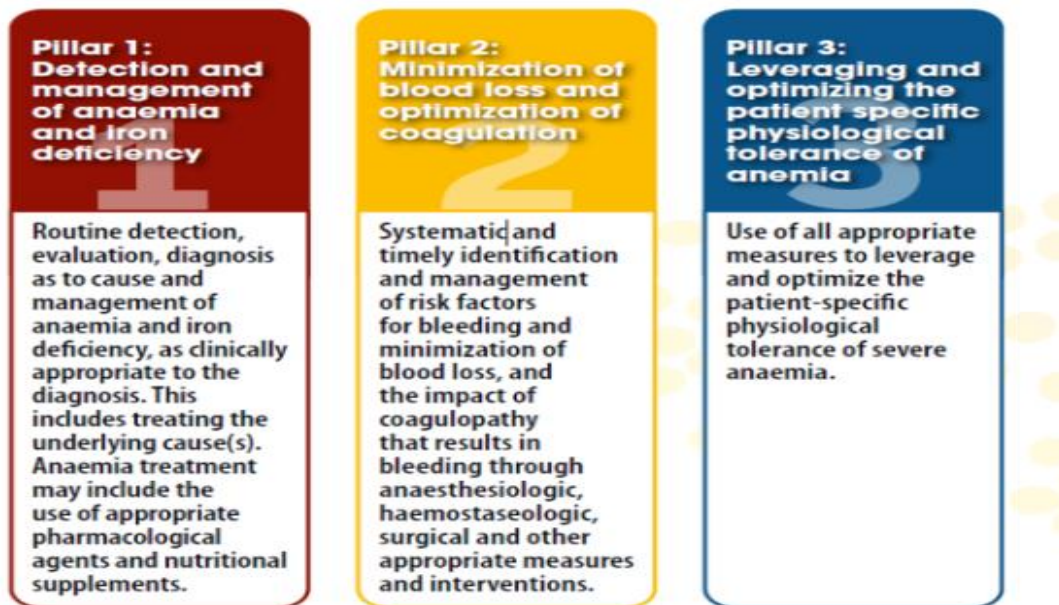


Figure 1: The three pillars of PBM from the WHO policy brief: The urgent need to implement patient blood management.¹⁶

Over the last decade, PBM programmes have been implemented mainly in high-income countries (HICs). Implementation of basic PBM measures such as improved pathways for anaemia management, use of intravenous (IV) iron, cell salvage, electronic blood ordering, and surveillance systems, coupled with PBM education initiatives, have yielded improved patient outcomes, reduction in preoperative anaemia, reduction in hospital-acquired complications, decrease in-hospital mortality and length of hospital stay, reduction in the use of blood and blood products, with an overall decrease in healthcare costs.^{35,40,43,49-53}

Despite the compelling evidence for improved patient and health outcomes, uptake and implementation of PBM is poor or slow, particularly in LMICs, where the need for it is the greatest.¹⁶ In 2021 the WHO released a policy brief calling for countries across the globe to urgently implement PBM as an overall framework to address the risks of ID, anaemia, blood loss and coagulopathy.¹⁶

They highlight the persistent lack of PBM awareness, culture, behaviour, existing medical dogma, and the long-established habit of transfusion as the usual care for anaemia and bleeding as barriers to the adoption of PBM.¹⁶

In addition to education deficiencies, resource and infrastructure limitations such as lack of access to cell salvage equipment to preserve patients' own blood in the perioperative setting, availability, and use of antifibrinolytic agents such as tranexamic acid, and lack of point-of-care coagulation testing in some countries have been reported as stumbling blocks.^{17,54} Similar challenges also potentially exist in SA and other LMICs.

PBM is still an emerging concept in SA and has not yet been formally endorsed by South African healthcare authorities. However, the benefits of PBM have caught the attention of the two blood services in the country and a community of health professionals currently serving as 'PBM champions.' Collectively, they are working towards creating awareness, and steering the implementation of PBM initiatives in some hospitals. Changing familiar practices such as the ingrained historic 'knee-jerk' approach of using blood transfusions to correct 'low' Hb levels is, however not a simple task.

The implementation of appropriately tailored strategies and tools can help overcome these barriers and lay the foundation for a culture of PBM practices. Approaches to implementing evidence-based PBM practices therefore call for a multifaceted strategy that incorporates education, buy-in, and support of healthcare leadership, along with fit-for-purpose practice-guiding tools. In light of these support needs, the researcher considered it imperative to construct a broad framework to guide the development of a PBM toolkit as a resource to support the implementation of PBM interventions in South African hospitals and enable clinicians to optimise the care of patients whilst reducing unnecessary transfusions. As a starting point, a clear understanding of the terms 'framework' and 'toolkit' is important.

The Cambridge Dictionary defines framework as “a supporting structure around which something can be built; a system of rules, ideas, or beliefs that is used to plan or decide something.”⁵⁵ Frameworks provide a broad set of constructs that organise concepts and data descriptively without specifying causal relationships, and they also provide a prescriptive series of steps summarising how implementation should ideally be planned and carried out.⁵⁶

In professional education, a ‘toolkit’ is defined as a resource that helps a professional to improve his or her competence, knowledge, or skills.⁵⁷ A toolkit can serve as a comprehensive step-by-step guide, containing the necessary information, resources, templates, and instructions thus serving as a roadmap to successfully bring evidence-based practices (EBPs) to a healthcare organisation.⁵⁸

In the context of this study, the definitions ‘framework’ and ‘toolkit’ put together provide a user-centred comprehensive structure of information and resources that can be tailored to support the implementation of PBM in hospitals across SA and elsewhere.

In recent years some guidance measures for PBM implementation have been published; however, these have been informed largely by the experiences of HICs. They do not take into account the particular needs of the various healthcare levels (primary, secondary, and tertiary hospitals); nor do they consider the disease burdens, healthcare demands, resource challenges, education deficiencies, and lack of expertise faced in resource-limited healthcare settings. The true value of guidance measures lies in their practical applicability, especially in contexts like SA, where we navigate between the theoretically sound recommendations from HICs and the challenging reality of limited resources and expertise required for implementation. Adopting guidelines and strategies applied in HICs may not always be practically feasible in LMICs.

The value of this research is that it lays the foundation for the development of a PBM toolkit comprising guidance measures appropriate for the South African healthcare context. By taking

into consideration the infrastructure, resource limitations, knowledge deficiencies, and educational needs across the various healthcare settings, private and public (primary, secondary, and tertiary level) hospitals, a toolkit informed by the framework, tailored to address these factors will provide invaluable guidance for the stepwise implementation of PBM practices not only in SA, but also in Africa, other LMICs, and beyond.

Education is key. Improving clinicians' knowledge of why changes in practice are needed, accompanied by the right mix of accessible PBM modalities, policies, procedures, protocols, educational material, etc., as practice guiding tools is a logical step towards laying the foundation for PBM as a standard of care.

1.2 PROBLEM STATEMENT

Bisbe *et al.* identify, among other factors, the absence of a widely accepted, evidence-based, practical framework for the implementation, targeting, and monitoring of PBM programmes in hospitals and healthcare organisations in LMICs as a significant barrier to effective PBM implementation.⁵⁹

The problem that has been addressed in this study is the absence of a framework of guiding resources as tools to guide the implementation of PBM practices and support clinicians in optimising the care of patients.

1.3 MOTIVATION FOR THE STUDY

The motivation for this study is multi-fold. First, on a personal level, as the researcher, I witnessed the implications and harms of blood transfusions when, a few years ago, my elderly mother was inappropriately managed for chronic ID. Daily phlebotomy contributed to anaemia during her hospital stay for the treatment of an infection. The treating physician transfused her with two units of RBCs to bring up her Hb level; she however showed no increment after the transfusion.

Rather than investigating the reasons for the non-increment, she was transfused again with another two units of blood, following which her condition deteriorated. She suffered a haemolytic transfusion reaction due to sensitisation and alloimmunisation from the first transfusion. Although transfused with ABO and Rh matched crossmatch compatible blood, the initial transfusion exposed her to other blood group system antigens she lacked thus stimulating the production of clinically significant antibodies which caused the transfusion reaction.

Although we (the family) requested that she be given IV iron infusions rather than blood transfusions, her physician expressed resistance, explaining that he would need to submit a written motivation to the health insurer for the approval of IV iron. He added that the turnaround time for a response from the insurer was between two to three days, and motivations were often rejected, which meant that patients had to be transfused with blood anyway. It was therefore “better” to prescribe readily available blood transfusions instead.

In light of his patient wanting to go home sooner, the blood transfusion would result in a quicker discharge time. The physician also expressed concerns about potentially severe reactions associated with IV iron. Anaphylaxis is rare, especially with the newer preparations, and is one of the myths of IV iron.⁶⁰

We, however, learned that my mother had signed the consent for blood transfusions along with a host of documents issued to her for signature at the time of her hospital admission. My mother suffered renal impairment following the blood transfusions, her health deteriorated over the months, and she passed away a year later.

Second, as the researcher, working at the South African National Blood Service (SANBS), I have been actively involved in transfusion medicine education and training of doctors preparing for the specialist examinations in Haematology, Clinical Haematology, and Paediatric Haematology. These doctors, like many others, transfuse patients daily.

Their general lack of knowledge of transfusion practice standards and PBM concerned me. These doctors who were in their specialisation phase of their medical careers, commonly expressed that throughout their medical training, they had little or no educational exposure to good clinical transfusion practices. Some admitted to not having heard of PBM.

Although PBM is not focused solely on transfusions, educating clinicians on the pillars of the patient-centred PBM paradigm of care, whilst highlighting the risks and harms of blood transfusion and sketching the principles of good clinical transfusion practices, is important in bridging knowledge gaps among doctors. Empowering them with the right education and clinical practice tools will enable them to apply improved clinical reasoning and appropriate treatment regimens that improve patient outcomes.

1.4 RESEARCH QUESTION

The research question addressed by this study is as follows: What are the essential, feasible, cost-effective components needed for a framework to guide the development of a patient blood management toolkit that can support the implementation of PBM practices in South Africa and enable clinicians to optimise the care of patients and minimise inappropriate blood transfusions?

1.4.1 Ancillary Questions

- (i) What tools are needed to support the implementation of PBM in primary, secondary, and tertiary-level hospitals?
- (ii) What are the PBM awareness gaps and educational deficiencies that need to be addressed among clinicians and other stakeholder groups?
- (iii) What are the practical approaches for implementing PBM and how should a PBM toolkit be tailored to support implementation?

1.5 STUDY AIM

The aim of the study is to develop a validated framework of cost-effective, feasible, evidence-based PBM measures to serve as a resource to guide the development of a toolkit that can support PBM implementation in hospitals and assist clinicians in optimising the care of patients and minimising inappropriate blood transfusions.

1.6 OBJECTIVES

The following are the study objectives:

- (i) To conduct a study of the available literature to gain a perspective on the PBM implementation experiences of countries across the globe regarding strategies and tools implemented, challenges and barriers encountered, and outcomes achieved.
- (ii) To explore the experiences of PBM champions currently working in or who have previously worked in South African hospitals, to gain their perspectives on the challenges and barriers to PBM implementation in SA, and the essential educational and clinical practice tools needed to support implementation.
- (iii) To gain validation through consensus from PBM experts on the essential, feasible, cost-effective, and evidence-based tools appropriate for a South African healthcare-focused PBM toolkit.
- (iv) To develop a broad framework as a template to guide the development of a PBM toolkit that can support PBM implementation in SA and beyond, thereby providing clinicians with educational and clinical practice tools to optimise the care of patients.

1.7 ETHICAL CONSIDERATIONS

Ethics approval for this study was obtained from the University of Cape Town (UCT) Human Research Ethics Committee (*Appendix H: UCT HREC reference: 6682021*) and the South African National Blood Service (SANBS) Human Research Ethics Committee (*Appendix I: SANBSHREC*

(reference: 2021/-0584). The participants for the study were invited to participate based on the criteria specified for this study. Participation was entirely voluntary and no incentives were provided. Documented written informed consent was obtained from the study participants. Strict confidentiality of the collected data and anonymity of participants were maintained at all times. Interviews with the participants were planned and cautiously facilitated to ensure that at no stage any derogatory or inappropriate statements directed at institutions, practitioners, or any other body or person were made. Respect and professionalism were maintained at all times. The study did not present any significant risks to participants beyond the time spent, insights and experiences they shared through the interviews and surveys.

1.8 IMPLEMENTATION OF FINDINGS

Implementation science is a branch of health science directed at approaches to promote the adoption and integration of EBPs, interventions, and policies into routine healthcare and public health practice to improve the impact on population health.⁶¹ It must be noted that the aim of this study is not the implementation of a PBM toolkit; the aim rather is the development of a comprehensive framework to guide the development of a toolkit that can be tailored to support the PBM implementation needs, resource capabilities, barriers, and challenges of the various hospitals.

Formal implementation of PBM requires strategic planning and execution. A toolkit guided by the framework presented as the outcome of this study offers the opportunity to guide and support implementation in a stepwise manner. The fundamental aspects of implementation science have therefore been included in the literature review (Chapter 3), and the recommended tools to support PBM implementation in South African hospitals have been discussed in Chapter 7 of this study.

The results of this research study will be shared with the SSA PBM social media group. This group, formed in 2018, is made up of like-minded healthcare professionals with a keen interest in promoting PBM education and supporting the implementation of PBM initiatives in SSA. The study findings will also be shared with the Lead Consultants at the SANBS and the Western Cape Blood Service (WCBS), who are also part of the SSA PBM group. Although not based in the clinical environment, the Blood Service stakeholders are actively creating PBM awareness, partnering with clinicians and leading PBM interventions in hospitals across the country.

Through the SSA PBM group and the two blood services, the findings of the study will be shared with the growing pool of PBM champions across the public and private sector hospitals in SA, including the leadership of hospital governance committees such as the hospital transfusion committees (HTCs) and blood user committees. Sharing the broad research-informed PBM toolkit framework with these important stakeholder groups is intended to influence buy-in and support for PBM.

The PBM educational needs for doctors and nurses identified and reported in this study have already contributed to the development of two online short learning programmes in PBM for doctors and nurses respectively. The learning programmes which are the first of their kind in Africa are currently offered by the University of the Free State (UFS). This PBM education initiative aimed at bridging existing PBM knowledge gaps not only in SA but also in Africa and beyond is the result of a collaboration between SANBS and the UFS. The researcher is the project leader from the SANBS side, actively contributing to the empowerment of doctors and nurses through education tailored to the South African and African healthcare context.

1.9 ARRANGEMENT OF THE THESIS

In Chapter 1 the introduction, background, and rationale for the study are provided. The problem is stated, and the research question, aim, and objectives of the study are presented. The ethical considerations and the implementation of the study findings are outlined.

In Chapter 2 the literature on PBM is presented and includes the definition and origin of PBM, an overview of the PBM pillars, and the benefits reported in countries that have implemented PBM programmes. The chapter contextualises the anaemia disease burden and the inappropriate use of blood transfusions in its treatment, outlining the associated patient and overall healthcare implications. The chapter concludes with the important need for PBM implementation as a framework to address the risks of anaemia, ID, and bleeding, offering a solution to address several transfusion-related healthcare challenges in SA and beyond.

In Chapter 3 the perspectives on developing a toolkit to support the implementation of PBM practices in SA and elsewhere are presented. The major barriers and challenges to PBM implementation faced globally and in resource-limited healthcare settings are outlined. The role and development of a toolkit in the implementation of EBPs are explained, highlighting considerations for low-resource settings.

In Chapter 4 the research design, theoretical perspectives, and a detailed description of the methodologies employed to achieve the study aim and objectives are presented. The approach to the literature review is outlined. The mixed-method approach applied in this study is presented, which included:

- (i) one-on-one semi-structured interviews with PBM champions, which explored their experiences with implementing PBM interventions in their hospital settings, and suggestions on the essential PBM tools and educational support measures needed for PBM implementation in SA, and

- (ii) the Delphi survey in which a panel of PBM experts rated the combined data from the interviews and literature review to gain consensus on the essential, feasible, cost-effective, evidence-based PBM tools needed to guide and support the implementation of PBM in South African hospitals.

In Chapter 5 the results, data analysis, and findings of the one-on-one semi-structured interviews are reported.

In Chapter 6 the results, data analysis, and findings of the Delphi survey are reported.

In Chapter 7 the framework for a PBM toolkit appropriate for the South African healthcare context as the key outcome of this study is presented and discussed through integration of the collective findings of the literature review, semi-structured interviews, and Delphi survey.

In Chapter 8 the final recommendations, value of the study, limitations, opportunities for further research, and conclusions are presented.

1.10 CONCLUSION

Chapter 1 has provided the introduction, background, and context to this research study. The problem statement, research question, study aim, and objectives were outlined. The ethical considerations and value of the study were explained. The next chapter presents the first section of the literature review on PBM as an approach to reduce the risks associated with anaemia and a potential solution to transfusion-related healthcare challenges in SA.

CHAPTER 2: LITERATURE REVIEW

THE NEED FOR A PBM IMPLEMENTATION FRAMEWORK AT A GLOBAL LEVEL AND IN SOUTH AFRICA

2.1 INTRODUCTION

The anaemia disease burden, the implications for patients and health systems, its suboptimal management and the overuse of blood transfusions in the treatment of anaemia are global concerns. PBM – the origins of which can be traced back to the 1950s when the concept of ‘bloodless medicine and surgery’ was pioneered, proving that a patient's own blood can be optimised and allogenic transfusions avoided – offers evidence-based solutions to the concerns mentioned.^{62,63} The literature that follows contextualises the health burden of anaemia, outlines current gaps in treatment, and explains the importance of implementing PBM as a framework to address the risks of anaemia, ID, blood loss and coagulopathy.

The literature review was part of the methodology applied in the data collection for this study and was conducted electronically by searching the PubMed database using Medical Subject Headings (MeSH) related to the study's aim and objectives. MeSH is an organised vocabulary system that aids the search for biomedical and health-related information.⁶⁴ The literature review process is described in detail in Chapter 4: Research Methodology.

This chapter introduces PBM, explains its origin, describes the principles and pillars of care, and outlines the patient and healthcare benefits gained from its implementation in countries across the globe. An overview of the South African healthcare structure is presented, and the broad healthcare and transfusion-related challenges are outlined. The chapter concludes with the global imperatives for implementing PBM programmes as a solution to address several healthcare and transfusion-related challenges in SA and elsewhere.

2.2 ANAEMIA – A GLOBAL HEALTH BURDEN

Anaemia is a global health problem associated with poor health outcomes, increased morbidity and mortality, and substantial health and economic costs.^{24,65-69}

The WHO defines anaemia as a condition in which the number of RBCs and their oxygen-carrying capacity are unable to meet the body's physiological needs.^{15,70} It is the most common haematological abnormality, mainly affecting infants and young children, pregnant and postpartum women, and menstruating adolescent girls.^{15,66} In 2021 the global prevalence of anaemia across all ages was 24.3% (95% uncertainty interval [UI] 23.9–24.7), corresponding to 1.92 billion (1.89–1.95) prevalent cases, with children younger than five years, women, and countries in SSA and south Asia being particularly affected.⁶⁹

In SA almost one in five adults and 10.7% of children under the age of five are anaemic.⁷¹ In 2018, the population of SA totalled 57.8 million and included an estimated 17.8 million people suffering from anaemia, mostly neonates and children, women of reproductive age, and the elderly.^{24,72-74} A systematic review and meta-analysis of the prevalence, risk factors and outcomes of anaemia in South African pregnant women conducted in 2022 showed that the pooled prevalence of anaemia in pregnant women in SA was determined to be 31% (95% confidence interval [CI] 23–40%).⁷⁵ While ID was reported as the main cause, other risk factors included HIV and other infections.⁷⁵

2.2.1 Causes of anaemia and iron deficiency

Anaemia is generally classified according to its cause. Nutritional anaemia often results from inadequate intake of micronutrients, such as iron, folate, riboflavin, vitamins A, B12, and C required for blood formation.⁷¹ Other causes of anaemia include heavy menstruation, increased iron requirements during pregnancy and in growing children, chronic infections (such as tuberculosis, HIV, hookworm, and malaria), and poor iron absorption, transport, and storage,

including haemoglobinopathies.^{71,76,77} ID is the cause of at least 50% of all cases of anaemia worldwide.^{75,78-80} Nutritional ID is caused by low dietary iron intake, increased iron demand and/or iron loss, as well as low bioavailability of iron from staple foods.^{71,81} ID can occur in the presence or absence of anaemia.⁸² Globally, it is estimated that ID anaemia (IDA) affects 1.2 billion people, and non-anaemic iron deficiency (NAID) is at least twice as common.⁷³

Table 1 below provides a comprehensive list of the causes of absolute ID as presented by Pasricha *et al.*⁸³

Table 1: Causes of absolute iron deficiency, as presented by Pasricha *et al.*⁸³

INADEQUATE IRON UPTAKE • Inadequate nutritional iron intake ○ Inadequate dietary iron content ○ Low haem iron content (e.g. from a vegetarian or vegan diet) ○ Food insecurity or low dietary diversity (e.g. resulting from poverty, especially in low-income countries) ○ Low iron content complementary diet (e.g. prolonged breastfeeding, or milk preference) • Inadequate nutritional iron absorption ○ Concomitant consumption of inhibitors of iron absorption (e.g. calcium or tea) ○ Inadequate stomach acidification ▪ Atrophic gastritis ▪ Use of antacids or proton pump inhibitors ▪ <i>Helicobacter pylori</i> infection ▪ Procedures after gastric bypass • Intestinal mucosal dysfunction (e.g. coeliac disease or inflammatory bowel disease) • Obesity • Inappropriately increased hepcidin concentrations preventing iron absorption (e.g. during chronic inflammation or iron-refractory iron deficiency anaemia caused by <i>TMPRSS6</i> mutations)

INCREASED IRON REQUIREMENTS

- Growth (e.g. during early childhood and adolescence)
- Pregnancy
- Physiological blood losses exceeding iron intake
- Erythropoiesis stimulating agent therapy

BLOOD LOSS

- Intestinal blood loss
 - Oesophageal
 - Varices
 - Carcinoma
 - Ulceration
 - Reflux oesophagitis
- Gastric
 - Gastric cancer and gastric polyps
 - Gastric ulcers
 - Use of aspirin and other non-steroidal anti-inflammatory drugs
 - Angiodysplasia, telangiectasia, and gastric antral vascular ectasia (watermelon stomach)
- Small bowel
 - Hookworm (*Ancylostoma duodenale* and *Necator americanus*)
 - Inflammatory bowel disease
 - Duodenal ulcers
 - Lymphoma, cancer, and polyps
 - Angiodysplasia, telangiectasia, and Meckel's diverticulum
 - Extreme exercise-induced gastrointestinal bleeding
 - Milk protein allergy (in infants younger than 12 months)
- Colon
 - Colon cancer
 - Polyps
 - Diverticular bleeding
 - Angiodysplasia
 - Inflammatory bowel disease
 - Heyde's syndrome (severe aortic stenosis, acquired type 2 Von Willebrand syndrome, angiodysplasia, and iron deficiency anaemia)
 - Hamartomatous polyps in Peutz-Jeghers syndrome
- Anal
 - Haemorrhoids
- Entire gastrointestinal tract
 - Hereditary haemorrhagic telangiectasia

- Gynaecological bleeding
 - Menstrual (e.g. in premenopausal women and girls)
 - Exacerbated by bleeding disorders (von Willebrand disease, carrier for haemophilia A or B, and platelet dysfunction)
 - Use of an intrauterine device
 - Fibroids
 - Uterine or other reproductive tract cancers
- Urinary tract bleeding
 - Renal or bladder cancer
 - Urinary schistosomiasis (*Schistosoma haematobium*)
 - Intravascular haemolysis (e.g. paroxysmal nocturnal haemoglobinuria)
 - Intravascular haemolysis (e.g. valve haemolysis, march haemoglobinuria, and malaria)
- Respiratory bleeding
 - Severe haemoptysis (e.g. lung cancer and infection)
- Blood donation (especially whole-blood donation)
- Excess iatrogenic blood losses (e.g. excessive blood collection for diagnostic testing and iron losses during haemodialysis)
- Self-inflicted blood loss (Munchausen syndrome)

Exercise: Multifactorial – reduced dietary iron intake, reduced iron absorption due to inflammation, increased losses in sweat, gastrointestinal bleeding, and haemolysis with haemoglobinuria.⁸³

Anaemia of chronic disease or anaemia of chronic inflammation is the most common cause of anaemia in hospitalised patients.⁸⁴ It is the second most prevalent cause after ID, and it may be difficult to delineate the prevalence rate of this condition as it is often confused with IDA.⁸⁵⁻⁸⁷ Diligent efforts should therefore be made to unravel the underlying cause of anaemia in all patients and to rule out ID.⁸⁵ The successful management of either condition is reliant on making a correct diagnosis, as each would require different treatment protocols.^{88,89}

2.2.2 Consequences of anaemia

In the 2021 Global Burden of Diseases, Injuries, and Risk Factors study, anaemia was reported to be the third leading cause of disability worldwide, after low back pain and depressive disorders.¹⁴ The condition leads to a wide range of health problems.

Not only does it diminish productivity in adult life and overall quality of life for those affected, it also brings significant financial implications for individuals, families, communities, and countries.^{14,15}

In hospitalised patients, the prevalence of anaemia is even higher than in the general population and it is an independent predictor of adverse outcomes, including morbidity, mortality, increased rates of infectious complications, prolonged hospitalisation, and an increased likelihood of allogeneic blood transfusions.^{24,34,90-93} Anaemia can affect the outcomes of patients presenting to various medical and surgical specialties, especially those with chronic conditions and the elderly.⁷⁹ The incidence of anaemia increases within processes of care, such as procedural blood loss and phlebotomy.^{36,37}

2.2.2.1 Surgical patients

Perioperative anaemia is an independent risk factor for increased length of hospital and intensive care unit (ICU) stay, postoperative complications and increased mortality.⁹⁴ Anaemic patients who undergo surgery tend to have worse outcomes than those who are not anaemic.^{90,95-99} A large prospective observational South African surgical outcomes study of patients undergoing inpatient non-cardiac, non-obstetric surgery at 50 hospitals across SA over a seven-day period showed that the prevalence of preoperative anaemia was 47.8%, and that it was independently associated with an increase in in-hospital mortality (odds ratio [OR] 1.657, 95% CI 1.055–2.602; $p=0.028$) and admission to critical care (OR 1.487, 95% CI 1.081– 2.046; $p=0.015$).⁹²

2.2.2.2 Women and children

Worldwide, heavy menstrual bleeding (HMB) is the most common cause of ID and IDA in women of reproductive age.^{100,101} Munro explains that the impact of HMB may be even more striking in LMICs than in other settings challenged by nutritional insecurity, suggesting that in such

environments the cumulative iron depletion caused by HMB would propel vulnerable girls and women further into negative iron balance and IDA.¹⁰¹

Anaemia in pregnancy is associated with increased rates of preterm labour, postpartum haemorrhage (PPH), low birth weight, short gestation, stillbirth, and infections for both child and mother.^{15,69,102} Anaemia in children is linked with impaired cognitive and motor development and susceptibility to infections, potentially increasing the risk of mortality during childhood from severe infections, such as those due to malaria.^{69,103,104}

The potential impact of periconceptual ID and IDA on the developing foetus is particularly concerning, because of evidence of potentially irreversible adverse effects on foetal neurologic development that have been linked to increased risks of various psychological and psychiatric outcomes.¹⁰¹ Low umbilical ferritin concentrations found in infants have shown adverse effects on early neurological and behavioural function that appear to extend into adulthood.^{105,106} Early identification of ID and appropriate treatment are key steps in protecting the health and well-being of all at risk.¹⁰¹

2.3 GAPS IN TREATMENT OF ANAEMIA

According to the WHO, the high prevalence of anaemia in most medical, surgical and obstetric populations is under-recognised by health system leaders and most clinicians.^{16,73,107} Franchini concurs that overlooked, underdiagnosed and undertreated anaemia is not uncommon, and can severely affect patients' outcomes, imposing a significant burden on healthcare systems.¹⁰⁸

Muñoz *et al.* explain that there are several non-evidence-based misconceptions regarding the diagnosis and management of ID with or without anaemia, which include inconsistencies in terminology and a lack of clear guidance on clinical pathways.¹⁰⁹ They add that the pathogenesis of ID is still frequently not addressed, iron not replaced, with indiscriminate RBC transfusion used as a default therapy.¹⁰⁹

2.3.1 Blood transfusions: A risk-associated treatment approach

Increasing evidence suggests that transfusion of allogeneic blood products is associated with increased morbidity and mortality due to infectious and non-infectious complications.^{39,110-114} Despite the well-established risks, transfusions remain one of the most common, often unnecessary, and overused medical interventions in the treatment of anaemia and blood loss in hospitalised patients.^{6,19,36,44} In recent years, in certain settings, transfusions per 1 000 patients have declined, pointing to some progress being made.¹¹⁵

Blood transfusion is a well-documented mode of transmission of HIV, hepatitis B virus (HBV), hepatitis C virus (HCV), and other infectious agents.¹¹⁶ In SA, blood donations are screened for HIV, HBV, HCV, and syphilis through a combination of serological and individual donation nucleic acid testing (ID-NAT).¹¹⁷ The SANBS collects approximately 900 000 blood donations per annum in a high HIV burden context and screens individual donation samples in parallel for HIV RNA using ID-NAT and anti-HIV antibodies.¹¹⁸ Approximately 1 600 confirmed HIV seropositive and 60 HIV NAT yield (NAT-positive, antibody-negative) donations are identified per year.¹¹⁸ Although the sensitivity of the current ID-NAT technology has reduced window period transmission risks for HIV, HBV, and HCV, it has not been able to eliminate them.

Vermeulen *et al.* reported on a 10-year review of the HIV transfusion transmission risk in South Africa following the implementation of ID NAT testing in 2005. For the period (2005-2015), the transfusion-transmissible risk was reduced from 24 to 13 per million transfusions. ID-NAT interdicted 481 (1:16,100) seronegative window period donations, while one transfusion-transmissible case (0.13 per million) was documented.¹¹⁸

In the present time, even in developed countries, the greatest risk to the patient lies in non-infectious complications of transfusions, which account for significant morbidity and mortality.¹¹⁹ Common non-infectious risks to transfusion include febrile non-haemolytic

reactions, allergic reactions, transfusion-associated circulatory overload (TACO), transfusion-related acute lung injury (TRALI), transfusion-related immunomodulation, and acute and delayed haemolytic transfusion reactions.¹²⁰ Reactions can be asymptomatic, mild, or potentially fatal.^{119,120,2}

The leading causes of allogeneic blood transfusion-related mortality in the United States of America (USA) have been reported as TACO, TRALI, haemolytic transfusion reactions (HTRs) due to non-ABO incompatibilities, microbial contamination and allergy/anaphylaxis reactions and HTRs due to ABO incompatibilities.^{111,121,122}

Misdirected transfusions, where blood is incorrectly administered to a non-designated recipient, remain one of the most common types of error in transfusion practice.¹²³ It is mainly attributed to human error, the most common being incorrect identification of the patient or the blood unit at the bedside, and can lead to potentially fatal outcomes.^{123,124} The WHO recommends the development of systems, such as hospital transfusion committees (HTCs) and haemovigilance, to monitor and improve the safety of transfusion processes.^{113,119}

2.3.1.1 South African haemovigilance reporting

Haemovigilance is an organised scheme of monitoring, identifying, reporting, investigating and analysing adverse events associated with blood and blood product transfusion.¹²⁵ The recent South African haemovigilance report published by the Independent Haemovigilance Committee showed that in 2022, collectively across the two blood services in the country (SANBS and WCBS), 1 346 868 blood products were transfused. A total of 205 serious adverse events were reported, translating into a rate of 15.2/100 000 transfusions.¹²⁶ Compared to previous reports, the 2022 haemovigilance report excluded reporting of mild allergic reactions and febrile non-haemolytic transfusion reactions.¹²⁶

In 2021 a total of 1 265 722 blood products were issued, and 989 adverse transfusion events were reported, translating into an incidence rate of 78.1/100 000 units transfused.¹²⁷ In 2020 a total of 1 209 636 blood products were issued, and 1 042 transfusion-related adverse events were reported, translating into an adverse event rate of 86.2/100 000 patients transfused.¹¹⁷ This was the highest rate seen in the three-year period (2018–2021), with overall rates reported in 2018 being 81.4 and in 2019 being 78.0 per 100 000 patients transfused.¹¹⁷

In 2022 incorrect blood component transfusion, which has the potential to cause serious morbidity and death, accounted for the highest number of serious adverse events.¹²⁶ A total of 63 error events were recorded, accounting for 30.7% of all serious adverse events.

Hospital errors were due to either a sampling error resulting in the wrong patient's blood in the crossmatch tube, or a transfusion misdirected to the incorrect patient. Both circumstances were due to not correctly identifying the patient.¹²⁶

Overall, there were 26 patient deaths reported in 2022, 16 in 2021, and 27 in 2020.^{117,126,127} These cases were reported due to a temporal association between the patients' deaths and a blood product transfusion which was not necessarily causative. The lack of clinical detail and lack of resources to carry out post mortems on these patients make assigning attributability challenging.¹²⁶ This limitation, together with the premise that adverse events are generally thought to be underreported in SA, represents weaknesses in the local hospital haemovigilance reporting.

One transfusion-related adverse event or even one potential transfusion-related death is one too many. Therefore, as with any other tissue transplant, blood transfusion should be the last-resort treatment option, not the first reflexive action.¹²⁸ Recommendations proposed by the blood services in SA include the need for ongoing support of appropriate blood product usage, in keeping with PBM principles, to avoid unnecessary risk to patients.¹¹⁷ The importance of

preventing and avoiding transfusion risks by educating hospital staff to be vigilant at each step of the transfusion process was emphasised.¹¹⁷

Isbister *et al.* state that it is no longer acceptable to maintain a *laissez-faire* approach and assume the benefits and accept the risks of allogeneic blood transfusion, calling for patient safety and clinical practices that are informed by evidence.²¹

2.4 EVIDENCE-BASED PRACTICES

‘Evidence-based’ refers to interventions that have undergone sufficient scientific evaluation to be considered effective and/or are recommended by respected public health or professional organisations.¹²⁹ Melnyk *et al.* explain that EBP is a problem-solving approach to the delivery of healthcare that integrates the best evidence from studies and patient care data with clinician expertise and patient preferences and values.¹³⁰

They add that when delivered in a context of caring and a supportive organisational culture, the highest quality of care and best patient outcomes can be achieved.¹³⁰

The imprudent, inappropriate use of RBCs in the treatment of anaemia, long endorsed by non-evidence-based misconceptions, needs to be replaced by evidence-based alternatives that are beneficial for both patients and healthcare systems.¹⁰⁹ The international experience suggests that one of the most effective ways to bring about change in practice involves establishing formal, comprehensive, hospital-wide PBM programmes.^{23,40,41,128,131,132}

2.5 PATIENT BLOOD MANAGEMENT

PBM is a comprehensive care concept for hospitalised and non-hospitalised populations presenting with anaemia and micronutrient deficiencies, blood loss and coagulopathy, by routine detection, diagnosis and treatment on an aetiology-specific basis.¹³³ The PBM approach encompasses careful stewardship of the patient’s own blood and involves multiple disciplines:

medical, surgical, anaesthetic, nursing, pharmacy and laboratory, that share a common vision of improving patient outcomes.^{18,36,128,134}

2.5.1 Patient blood management principles and pillars

The Society for the Advancement of Patient Blood Management (SABM), WHO, and other experts highlight four core principles of PBM as:^{16,18,23,44,133,135}

- (i) Anaemia management by detecting anaemia, determining aetiology, treating the causes, using pharmacologic agents to support haematopoiesis, decreasing oxygen consumption, and transfusing blood products only when clinically indicated.
- (ii) Minimising bleeding and blood loss by using multidisciplinary blood-conserving strategies. These include performing minimally invasive procedures, when possible, minimising iatrogenic blood loss (e.g. repeated laboratory draws), using surgical techniques that limit blood loss, detecting and halting blood loss as quickly as possible, and employing transfusion techniques that minimise allogeneic transfusion (e.g. intraoperative red cell salvage, normovolaemic haemodilution).
- (iii) Optimisation of haemostasis and/or coagulopathy by appropriately evaluating coagulopathy/haemostasis, determining aetiology of coagulopathy, treating coagulopathy with targeted therapies, and transfusing blood product components only when clinically indicated.
- (iv) Patient-centred care by incorporating the patient's needs and concerns in the decision-making process, informing the patient on PBM-based treatments, alerting the patient to potential risks/benefits/alternatives of different treatment options, and working with the patient to determine the final treatment plan.

From its origins as a strategy for surgical patients, PBM has evolved over the years into a comprehensive care approach that can be applied equally to surgical and non-surgical

environments.⁵ As such, the pillars are being applied across specialties in the care of medical and surgical patients, pregnant women, neonates, children, adolescents, elderly people, and the population as a whole, with the overarching aim to improve patient outcomes while saving healthcare resources and reducing costs.¹⁶ PBM additionally provides a point of departure for educating patients, enabling them to understand their treatment options and involving them in their treatment decisions, thus improving patient satisfaction and comfort with the treatment process.¹²⁸

2.5.2 Patient-centred ethical care

Patient education and empowerment, informed consent and shared decision-making are the foundation and core upon which PBM is built.^{16,44,133} Involving patients in determining their own care is empowering, and it is a central tenet of patient autonomy, shared decision-making, and high-quality healthcare, that requires a collaborative relationship of trust between a patient and their healthcare provider.^{136,137} PBM subscribes to a patient-focused care paradigm that requires clinicians to do what is best for patients. The quote below highlights the “right clinician approach.”^{136,138}

“The good physician treats the disease; the great physician treats the patient who has the disease. It is much more important to know what sort of a patient has a disease than what sort of a disease a patient has.” – Sir William Osler, Canadian physician (1849–1919)

The ethical basis of the obligation to ask for the patient’s acceptance of treatment is grounded in the recognition of the personal dignity of the individual.¹³⁹ This together with the “principle of autonomy”, according to which a competent patient must be given the right to free, informed choices are fundamental principles of ethical practice.¹³⁹ Patient involvement, informed consent, and informed refusal are the cornerstones of ethical medical practice.¹⁴⁰

Patients are thus entitled to be informed about the benefits, risks, and alternatives to blood transfusion. They have the right to refuse blood transfusion as a treatment option, and clinicians should be prepared to manage such patients using alternate approaches.¹⁴¹ Refusal of blood transfusions by some patients was an important factor contributing to the origins of PBM.

2.5.3 The origins of patient blood management

Over the years, transfusion medicine has evolved from a laboratory service to a clinically focused service emphasising patient care.¹⁴² Despite many advances in transfusion medicine, not only do RBC transfusions remain an overused therapy, there is still great variability in transfusion practices across institutions and specialties.^{39,114}

To confront existing practices, several experts sought to investigate current practices and pinpoint transfusion predictors in the hope of optimising the care of patients.^{25,39,114,143,144}

Such investigations found that the aetiology of the underlying anaemia was often suboptimally addressed, with the variability in practice often attributable to disregarding of set protocols and published guidelines as well as ingrained institutional transfusion habits.^{25,39,114,143,144}

It was noted that optimising transfusion practices first required an evidence-based foundation for clinical guidance.¹⁴² How much and when to transfuse were questions that needed to be answered before well-supported transfusion guidelines could be proposed.¹⁴²

The concept of PBM emerged when it was identified that more than just restrictive transfusion triggers are needed to mitigate the inherent risks of transfusions, pointing to the need for adjunct therapies to treat anaemia.¹⁴² These adjuncts or alternatives to transfusion largely came from the literature on treating anaemia in patients who refused transfusions.¹⁴² The resulting body of work came to be known as ‘bloodless medicine and surgery’ and provided approaches to maximise haematopoiesis while minimising oxygen consumption and preventing blood loss.¹⁴⁵⁻¹⁵¹

2.5.3.1 Bloodless medicine and surgery – a paradigm shift

In 1957, Dr Denton Cooley, a renowned cardiovascular surgeon, referred to by many as the “father of modern bloodless surgery”, performed open-heart surgery without the use of blood transfusion.⁴⁶ Dr Cooley and his team pioneered the practice of “bloodless surgery” to accommodate Jehovah’s Witness patients requiring treatment without allogeneic transfusion.⁴⁴ They applied one of the basic elements of evidence-based medicine, which is “the integration of best research evidence with clinical expertise and patient values and preferences.”¹⁵²

In 1977, Ott and Cooley published their 20-year experience with a consecutive series of 542 Jehovah’s Witness patients ranging in age from 1 day to 89 years who underwent bloodless surgery.⁶² Early mortality (within 30 days after operation) was 9.4%. In 362 patients requiring temporary cardiopulmonary bypass, early mortality was 10.7%. Mortality was 13.5% among 126 patients who had single or double valve replacement. The only deaths among patients who had aortic valve replacement or repair of a ventricular septal defect occurred in those who had some serious complication before operation. Preoperative or postoperative anaemia was a contributing factor in 12 deaths, and loss of blood was the direct cause of three deaths.⁶² Ott and Cooley concluded that, under the right circumstances, cardiovascular operations can be performed safely in the majority of cases without blood transfusion.⁶²

This was an enormous paradigm shift at a time when cardiovascular surgeries were notorious for their dependence on large volumes of allogeneic blood.⁴⁴ The late 20th century thus saw a renewed focus on alternatives to blood transfusion and techniques to minimise blood loss, moving the focus from “product” to “patient.”^{153,154} This led to several academic health centres establishing ‘Bloodless Medicine & Surgery Programmes’ that specialise in treating patients who do not accept allogeneic blood transfusions.^{148,151,155,156}

Frank, Pippa and Sherd reported on a large retrospective cohort study of 1 111 adult inpatients at a single institution who declined allogeneic transfusion for religious or personal reasons between June 2012 and June 2016.¹⁴⁷ Patient characteristics, laboratory data, and transfusion rates, as well as clinical outcomes (morbidity, mortality, and length of stay) were compared to all other patients in the hospital who received standard care, including transfusions if needed (n = 137 009). Medical and surgical patients were analysed as subgroups.¹⁴⁸

Mean nadir Hb during hospitalisation was lower in the bloodless (9.7 ± 2.6 g/dL) compared to the standard care (10.1 ± 2.4 g/dL) group ($p < 0.0001$). Composite morbidity occurred in 14.4% vs 16.0% ($p = 0.16$) of the bloodless and standard-care patients, respectively. Length of stay and in-hospital mortality were similar in the bloodless and standard-care patients. After the Bonferroni adjustment for multiple comparisons, hospital-acquired infection occurred less frequently in the bloodless compared to the standard-care cohort (4.3% vs 8.3%) ($p < 0.0001$) in the medical patient subgroup, but not in the surgical subgroup.¹⁴⁸

After propensity score adjustment in a multivariable model and adjustment for multiple comparisons, bloodless care was associated with less risk of hospital-acquired infection (OR, 0.56; 95% CI 0.35–0.83; $p = 0.0074$) in the medical subgroup, but not in the surgical subgroup.¹⁴⁸ Median total hospital charges (by 8.5%; $p = 0.0017$) and costs (by 8.7%; $p = 0.0001$) were lower in the bloodless compared to the standard care cohort, when all patients were included.¹⁴⁸ Overall, adult patients receiving bloodless care had similar clinical outcomes compared to patients receiving standard care.¹⁴⁸

A study of cardiac surgery patients and a propensity-matched control group reported by Pattakos, Koch and Brizzio showed a lower incidence of myocardial infarction and reoperation for bleeding in the bloodless patient group.¹⁵⁷ They also reported shorter durations of mechanical ventilation, shorter length of both ICU and total hospital stays, and better one-year survival in the bloodless

patients.¹⁵⁷ Another study of patients ($n = 91$) undergoing cardiac surgery over a 10-year period (2000–2010) at a large academic health centre found similar outcomes in bloodless patients undergoing elective and emergency cardiac surgery.¹⁴⁹ The authors concluded that bloodless surgery can be performed with good outcomes, thus validating Dr Cooley's approach of integrating best research evidence with clinical expertise and patient preferences.^{149,152}

Over the years, PBM programmes have demonstrated improvements in transfusion and patient outcome-based metrics across specialties.^{40,146,158,159} The benefits of PBM led to its endorsement by the World Health Assembly in 2010.¹⁶⁰ In 2017, the European Commission recommended PBM as a standard of care.¹¹ In the recent WHO Action Framework to advance universal access to safe, effective, and quality-assured blood components in 2020–2023, the effective implementation of PBM is listed as one of six goals.^{11,16}

2.6 GLOBAL STATUS OF PATIENT BLOOD MANAGEMENT IMPLEMENTATION

PBM programmes have demonstrated successful implementation, predominantly in HICs, with notable examples including Australia, the USA, the United Kingdom (UK), Canada, Germany, Switzerland, Singapore, and the Republic of Korea, among others.^{17,35,40,41,43,49-54,131,132,161-163}

Of particular note is Australia's comprehensive nationwide adoption of PBM initiatives.^{40,131,163} LMICs, including countries in SSA, are in the early stages of developing PBM, with only a few reporting the implementation of PBM interventions in some of their hospitals.^{17,36,42,52,54}

In 2021, Hofmann, Spahn and Holtorf conducted interviews with PBM implementers from 12 countries in Asia, Latin America, Australia, Central and Eastern Europe, the Middle East, and Africa to analyse their PBM implementation experiences.¹⁷ Their findings revealed that Australia was the only country that was in a mature stage (high level of PBM implementation); China, South Korea, Turkey and some hospitals in Switzerland were in an advanced stage (strategic, coordinated approach) of PBM implementation, and Brazil, Croatia, Greece, Lebanon, Mexico,

Saudi Arabia and SA were classified as being in the initiation phase (few individual PBM initiatives with low level of coordination) of PBM implementation.¹⁷

An international survey administered by the International Society for Blood Transfusion (ISBT) examining hospital-based PBM implementation among its member countries revealed that of 277 respondents, 194 reported active engagement in PBM activities. The geographical distribution of these respondents demonstrated a significant disparity, with 63.9% representing HICs, predominantly from Europe and the Western Pacific regions, while LMICs constituted only one-third of the responses.¹⁶⁴

2.6.1 Outcomes of patient blood management implementation

2.6.1.1 Australia

Currently, Australia boasts one of the best-established PBM programmes. Western Australia reported one of the largest studies of 605 046 patients admitted to four major adult tertiary care hospitals between July 2008 and June 2014. PBM was implemented as a government-sponsored, state-wide standard of care across tertiary hospitals.^{40,131} Outcome measures were RBC, fresh-frozen plasma (FFP), and platelet units transfused; single-unit RBC transfusions; pretransfusion Hb levels; elective surgery patients anaemic at admission; product and activity-based costs of transfusion; in-hospital mortality; length of stay; 28-day all-cause emergency readmissions; and hospital-acquired complications.^{40,131}

Comparing the final year with baseline, units of RBCs, FFP, and platelets transfused per admission decreased by 41% ($p < 0.001$), representing a saving of AU\$18,507,092 (US\$18,078,258) and between AU\$80 million and AU\$100 million (US\$78 million and US\$97 million) estimated activity-based savings. Mean pretransfusion Hb levels decreased from 7.9 g/dL to 7.3 g/dL ($p < 0.001$), and anaemic elective surgery admissions decreased from 20.8% to 14.4% ($p < 0.001$). Single-unit RBC transfusions increased from 33.3% to 63.7% ($p < 0.001$).

There were risk-adjusted reductions in hospital mortality (OR 0.72; 95% CI 0.67–0.77; $p < 0.001$), length of stay (rate ratio 0.85; 95% CI 0.84–0.87; $p < 0.001$), hospital-acquired infections (OR 0.79; 95% CI 0.73–0.86; $p < 0.001$), and acute myocardial infarction and stroke (OR 0.69; 95% CI 0.58–0.82; $p < 0.001$).

Figure 2 below shows the key hospital-wide patient outcomes reported by Leahy *et al.*⁴⁰

Outcome variable*	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
In-hospital mortality						
Unadjusted rate, %	2.03	2.10	1.85	1.76	1.77	1.65
Adjusted OR (95% CI) [†]	Ref	1.01 (0.94-1.08)	0.95 (0.89-1.02)	0.89 (0.83-0.95)	0.81 (0.76-0.87)	0.72 (0.67-0.77)
Hospital length of stay						
Unadjusted mean, days	5.91	5.95	5.72	5.51	5.46	5.26
Adjusted rate ratio (95% CI) [†]	Ref	1.05 (1.03-1.07)	1.01 (0.99-1.03)	0.96 (0.94-0.98)	0.92 (0.90-0.94)	0.85 (0.84-0.87)
28-Day readmissions						
Unadjusted rate, %	11.42	11.82	12.74	13.57	13.27	12.42
Adjusted OR (95% CI) [†]	Ref	1.03 (0.99-1.07)	1.14 (1.10-1.18)	1.21 (1.17-1.26)	1.16 (1.12-1.20)	1.06 (1.02-1.10)
Hospital-acquired infection[‡]						
Unadjusted rate, %	—	2.34	2.04	1.78	1.80	1.95
Adjusted OR (95% CI) [†]	—	Ref	0.92 (0.85-0.99)	0.80 (0.74-0.87)	0.77 (0.71-0.83)	0.79 (0.73-0.86)
Acute myocardial infarction-stroke[‡]						
Unadjusted rate, %	—	0.50	0.48	0.40	0.42	0.36
Adjusted OR (95% CI) [†]	—	Ref	1.02 (0.86-1.20)	0.84 (0.71-1.00)	0.85 (0.71-1.00)	0.69 (0.58-0.82)

* Shown are the unadjusted and adjusted patient outcomes by financial year over the period of the patient blood management program.
[†] Ratios and 95% confidence intervals are adjusted for hospital, age, sex, Diagnosis-Related Group (DRG) category, admission type, indigenous status, and comorbidities.
[‡] Data were available for two of the four hospitals.
CI = confidence interval; OR = odds ratio; Ref = reference category.

Figure 2: Key hospital-wide patient outcomes achieved by implementing PBM programmes in Western Australia from the publication by Leahy *et al.*⁴⁰

The primary aim of the Western Australian approach was twofold:

- (i) to improve medical and surgical patient outcomes, and in doing so
- (ii) to achieve significant cost savings, and both aims were achieved.⁴⁰

A key aspect of the project was the identification of independent but modifiable risk factors for adverse patient outcomes, namely anaemia, blood loss, and blood transfusion.²³ They implemented a multimodal, multidisciplinary team approach which included the appointment of hospital-based PBM medical and nursing staff, education of clinical staff, provision of individualised data to support change in clinical practice, and the development of care pathways,

which included the involvement of primary care to ensure screening and correction of preoperative anaemia.

Figure 3 below shows that the PBM interventions applied achieved a decline in transfusion rates and red cell utilisation, despite an increasing population and hospital activity.⁴⁰

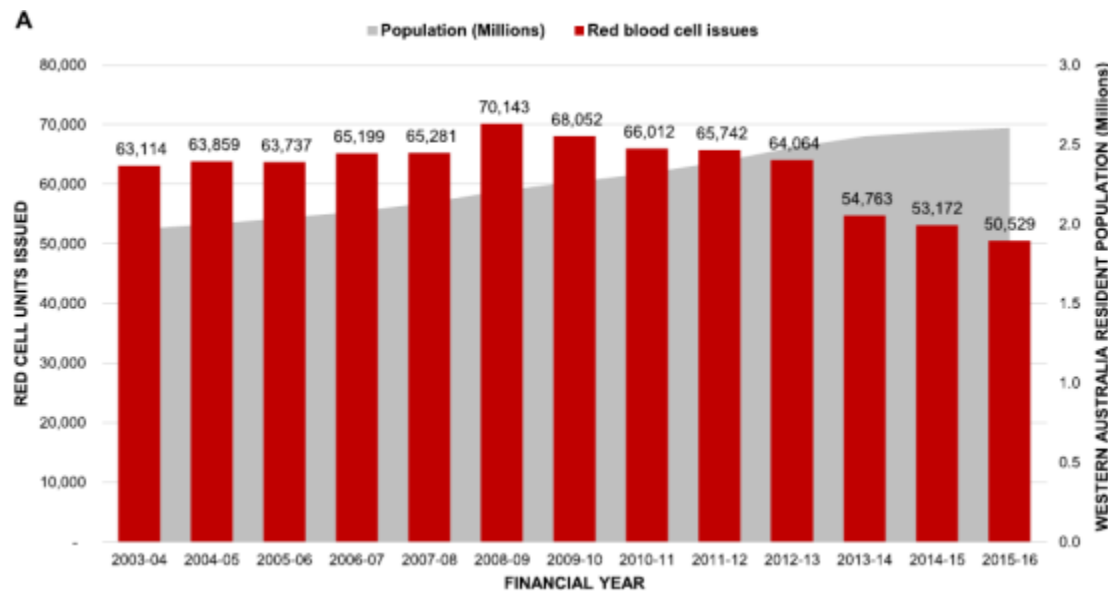


Fig. 1. (A) Data on RBC issues and resident population for the State of Western Australia from 2002-2003 to 2013-2014. RBC issuance data published and unpublished National Blood Authority (Australia) data printed with permission. Issuance of RBCs was progressively increasing in Western Australia. With the introduction of the Patient Blood Management Program in 2008-2009, this upward trend was arrested, and issuance has decreased each year despite an annual population increase.

Figure 3: Decline in transfusion rates and red cell utilisation in Western Australia despite an increasing population. Figure from the publication by Leahy *et al.*⁴⁰

2.6.1.2 Germany

The implementation of PBM in Germany was of critical importance since the country is one of the highest blood users worldwide.³⁴ Meybohm *et al.* recently published their findings on a prospectively designed, multicentre follow-up study of data retrospectively extracted from electronic hospital information systems in 14 German hospitals to assess the effectiveness and

relative safety of PBM.⁴³ A total of 1 201 adult in-hospital patients undergoing surgery and discharged between 01 January 2010 and 31 December 2019 were included in the analysis.⁴³

The PBM programmes focused on three domains: preoperative optimisation of Hb concentrations, blood-sparing techniques, and guideline adherence/standardisation of allogeneic blood product transfusions. The outcomes were utilisation of blood products, composite endpoint of in-hospital mortality and postoperative complications (myocardial infarction/ischaemic stroke/acute renal failure with renal replacement therapy/sepsis/pneumonia), anaemia rate at admission and discharge, and hospital length of stay.⁴³

The implementation of PBM resulted in a substantial reduction of RBC utilisation. The mean number of RBC units transfused per 1 000 patients was 547 in the PBM cohort vs 635 in the pre-PBM cohort (relative reduction of 13.9%). The RBC transfusion rate was significantly lower ($p < 0.001$) with an odds ratio of 0.86. Their analysis of more than one million surgical patients showed that the non-inferiority condition (safety of PBM) was fulfilled, and PBM was superior with respect to RBC transfusion rates.⁴³

2.6.1.3 Canada

Pavenski *et al.* report on important clinical outcomes of the Ontario Transfusion Coordinator (ONTraC Programme), a network of 25 hospital sites, working in coordination over the past 20 years.¹⁶⁵ Transfusion nurse coordinators were assigned to apply multimodal PBM best practices, including recommended changes in surgical approach, diagnosis, assessment, and treatment of anaemia, and adherence to more restrictive RBC transfusion thresholds. A significant reduction in RBC transfusions was observed for numerous indexed surgeries. RBC transfusion rates for knee arthroplasty decreased from 25% in 2002 to 0.4% in 2020. For coronary artery bypass graft surgery (CABG), transfusion rates decreased from 60% in 2002 to 27% in 2020.

Overall, they observed a decrease in RBC units utilised per transfused patient for knee (2.1 ± 0.5 [2002] vs 1.0 ± 0.6 [2020] units per patient) and CABG surgery (3.3 ± 0.6 [2002] vs 2.3 ± 1.9 [2020] units per patient). These reductions were associated with favourable clinical outcomes, including reduced length of hospital stay and a reduced rate of perioperative infections for non-transfused versus transfused patients.¹⁶⁵

2.6.1.4 England

PBM has been implemented to a greater or lesser extent in several European countries and across several hospitals; however, implementation remains variable.^{35,49-51} In England, reviews of blood utilisation in the National Health Service (NHS) indicated substantial inappropriate use of blood and blood products. PBM implementation was thus a collaborative initiative between the NHS and the National Health Service Blood and Transplant.⁵⁴ Implementation was through a multidisciplinary PBM team leading best practices through education, audit, research, and specialist transfusion advice.⁵⁴

A survey conducted to compare progress of PBM initiatives in 2015 versus 2013 reported the following improvements in 2015:¹⁶⁶

- Education/training in transfusion increased to 80–100% from 60–90% in 2013.
- Provision of information relating to consent for transfusion increased to 98% from 65% in 2013 ($p < 0.001$).
- Management of anaemia: elective general surgery management improved to 66% from 41% in 2013 ($p < 0.001$).
- Transfusion alternatives: Tranexamic use in surgery increased to 92% from 71% in 2013 ($p < 0.001$).
- Laboratory staff empowered to challenge transfusion requests increased to 95% from 65% in 2013 ($p < 0.001$).

2.6.1.5 Malaysia

Postpartum haemorrhage (PPH) remains one of the main causes of maternal mortality in Malaysia, a country where high parity is common among local women, and access to affordable healthcare remains a key challenge.⁵² Implementation of PBM Pillar One was prioritised, focusing on the identification and treatment of ID early in pregnancy and providing treatment with oral iron or IV iron, depending on patients' response to treatment and gestation. Transfusions were avoided in well-compensated patients or if other therapies were available, and when indicated a single RBC unit was given followed by clinical assessment to determine further need. Overall, the implementation of pillar one resulted in shorter length of hospital stay, improved Hb and ferritin levels, fewer adverse events, as well as reduced transfusion rates.⁵²

2.6.1.6 China

In China, the implementation of intraoperative autologous transfusions, minimising tissue injury during surgical operations, promoting endoscopic surgeries, and stricter adherence to transfusion guidelines, mainly in tertiary-level hospitals, yielded positive outcomes.⁵⁴ A nationwide survey showed that from 2011 to 2013, surgical operations increased year on year, but both the number of allogeneic transfusions per 100 operations and the number of RBC transfusions decreased.⁵⁴

2.6.1.7 Brazil

A university hospital in Brazil instituted educational programmes for clinicians, reformulation of the computerised system for the prescription of blood components, protocols for the use of antifibrinolytics in surgical patients, and institution of an outpatient clinic for evaluation and management of preoperative anaemia and indications for autologous donation.⁴² The adoption of PBM practices provided significant relief regarding blood supplies, especially during periods of scarcity, and enhanced patient safety and service quality. This improvement contributed to a more favourable perception of the hospital in external audits and accreditation evaluations.⁴²

2.7 THE NEED FOR PATIENT BLOOD MANAGEMENT IN SOUTH AFRICA

PBM offers multiple benefits at a global level. The healthcare systems of the advanced economies in both the private and public sectors have begun to move their focus towards pre-empting the causes for transfusion through PBM, rather than expanding the infrastructure to advance transfusion therapy.^{20,167} PBM has the potential to address several healthcare-related challenges that are specific to SA; the full implementation of PBM as a bundle of care is, however, challenging.^{20,38} Understanding the structure of the South African healthcare system and the existing challenges, including the disparities in access to healthcare, is an important starting point in contextualising the need for and considering approaches to implementing PBM in hospitals in SA.

2.7.1 Healthcare in South Africa

Healthcare delivery in SA operates under the administrative oversight of the Department of Health (DoH). The country has a two-tier (public and private) health system divided along socioeconomic lines.¹⁶⁸ The private sector caters for 16% of the population, primarily the middle- and upper-income classes, while the public sector serves the remaining 84%, predominantly comprising individuals from poorer communities.¹⁶⁸ The public health sector provides universal access to primary healthcare (PHC) services without point-of-service payment, operating within the district health system (DHS) framework. Healthcare delivery follows a hierarchical referral pathway that extends from community-based services through PHC facilities to district and regional hospitals.^{169,170}

Figure 4 below shows the organisation of public health services in SA and the system for integrated referral services.

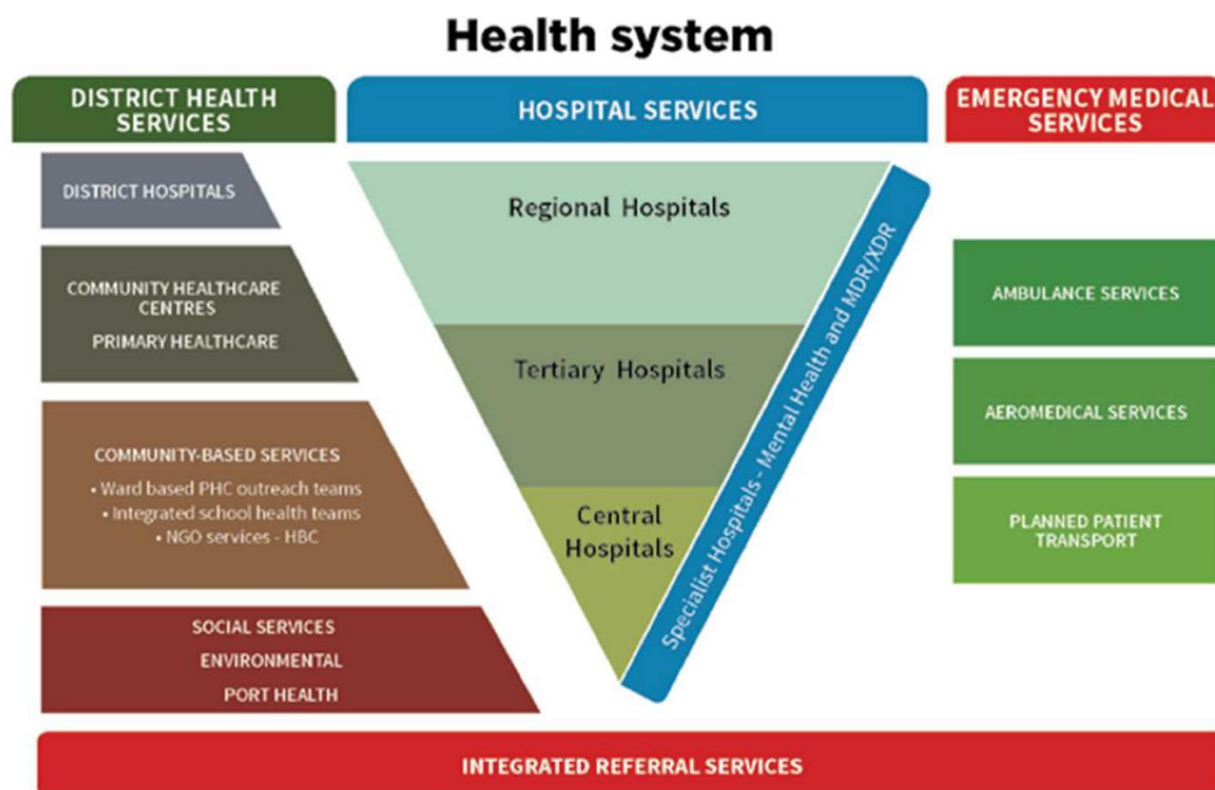


Figure 4: Organisation of public health services in South Africa and integrated referral services. From the National Department of Health. Referral Policy for South African Health Services and Referral Implementation Guidelines.¹⁷¹

Primary care is the first level of care and refers to services provided by general practitioners (GPs), nurses or other allied health professionals; it is the first point of entry to the health system.¹⁷² Primary care forms the foundation of healthcare; it is oriented towards disease prevention, and this level allows for early diagnosis and treatment as well as referral to secondary and tertiary care, thereby providing the potential for continuity of care.¹⁷² There are three levels of hospitals in the public healthcare system, which are classified as district (level one), regional (level two), and tertiary (level three) hospitals.¹⁷³

Table 2 shows the classification of hospitals in South Africa and the services provided at the various levels.

Table 2: Classification of hospitals in South Africa and the services provided at the various levels. From the National Department of Health: South Africa: *Referral Policy for South African Health Services and Referral Implementation Guidelines* (2020).¹⁷¹

DISTRICT HOSPITAL	REGIONAL HOSPITAL	TERTIARY HOSPITAL
Serves a defined population within a health district and supports primary healthcare	Has between 200 and 800 beds	Has between 400 and 800 beds
Provides a district hospital package of care on a 24-hour basis	Offers services to a defined regional drainage population, limited to provincial boundaries	May provide training for health service providers
Have general practitioners and clinical nurse practitioners who provide primary health services	Receives referrals from several district hospitals: provides short-term ventilation in a critical care unit and, where practical, provides training for healthcare service providers	Receives referrals from regional hospitals not limited to provincial boundaries
May only provide the following specialist services: - Paediatric health services - Obstetrics and gynaecology - Internal medicine - General surgery - Family physician	Provides healthcare in the fields of: - Paediatric health services - Obstetrics and gynaecology - Internal medicine - General surgery And at least one of the following specialities: - Orthopaedics - Surgery - Psychiatry - Anaesthetics - Diagnostic radiology - Trauma and emergency services	Provide specialist-level services provided by regional hospitals. Provides intensive care services under the supervision of a specialist or specialist intensivist.

2.7.1.1 District hospitals

The DHS has been adopted as the vehicle to deliver comprehensive PHC and some specialist services in SA.¹⁷⁴ These services include community-based services as well as services available at community-based clinics and health centres.¹⁷⁴ District hospitals are the first level of referral and are the highest level of support within the DHS, where generalist staff from a range of clinical disciplines provide generalist services to in-patients and outpatients (ideally on referral from a community health centre or clinic).¹⁷¹ They thus perform a gatekeeper role in supporting PHCs on the one hand and being a gateway to more specialised care on the other.^{171,175} While some larger district hospitals in urban areas have emergency medicine specialists, rural district hospitals are typically run by family physicians, and offer a 24-hour emergency centre, general outpatient clinics, non-specialised in-patient wards, and basic diagnostic and therapeutic services, such as X-rays and basic laboratory services.¹⁷³

District hospitals usually have a functional operating theatre. Operations are performed under general anaesthesia by non-specialist doctors (called ‘medical officers’), as there would not typically be any specialist anaesthetists or ICU.¹⁷³ District clinic and health centre surgical care is delivered by non-surgeons (GPs or family medicine specialists), or by surgeons from larger facilities who visit occasionally where outreach programmes have been set up.¹⁷⁶ District hospitals thus have limited surgical capacity, and most surgical conditions are referred to higher-level facilities for definitive management and necessary specialist care, surgery, intensive care, or special tests.¹⁷⁷⁻¹⁷⁹ This is consistent with district hospitals in other countries across SSA.^{180,181} For many South Africans, particularly those in rural areas, district hospitals are the only hospitals they will ever get admitted to.¹⁷³

2.7.1.2 Regional hospitals

Regional hospitals are level-two facilities that provide care requiring the intervention of specialists and GPs.¹⁷³ A hospital providing only a single specialist service would be classified as a specialised level-two hospital. An example of this may be a psychiatric hospital.¹⁷³ A general level two hospital would need to provide and be staffed permanently in at least five of the following eight basic specialties: surgery, medicine, orthopaedics, paediatrics, obstetrics and gynaecology, psychiatry, diagnostic radiology, and anaesthetics.¹⁷³

2.7.1.3 Tertiary and central hospitals

Tertiary healthcare services are provided at level three tertiary or academic hospitals, which provide highly specialised referral services.¹⁸² These hospitals receive patients from and provide sub-specialist support to several regional hospitals. Tertiary-level care requires the expertise of clinicians working as sub-specialists or in rarer specialties (e.g. within surgery, for example, sub-specialties such as urology, neurosurgery, plastic surgery and cardiothoracic surgery).¹⁷³

Central hospitals, which are few in number nationwide, provide tertiary hospital services and may offer national referral services. Central referral services are provided in highly specialised units, which require unique, highly skilled and scarce personnel.¹⁸³

2.7.2 Broad healthcare challenges – the African and South African context

In a 2019 study conducted as part of the African Epidemiological Association, Oleribe et al. reported the top four problems of the health sector in Africa as inadequate human resources, poor health resource allocation, poor maintenance of healthcare system infrastructure, and lack of political will.¹⁸⁴ Additional challenges included lack of access to healthcare, weak healthcare systems, high disease burdens, healthcare system corruption, poor leadership and administration, non-use of evidence-based interventions, poor quality of healthcare services, lack of good resource management, weak training and education of healthcare workers, weak

healthcare management information systems, non-prioritisation of healthcare activities, and professional rivalry.¹⁸⁴

In SA the high disease burden, including anaemia, HIV, tuberculosis, and noncommunicable diseases such as cardiovascular diseases, cancer, diabetes and chronic lower respiratory diseases, combined with human resource shortages, unequal resource distribution, long patient waiting times, medicine and equipment deficits, management issues, and slow healthcare system restructuring, present enduring healthcare challenges.¹⁸⁵ The Global Burden of Disease Study 2019 reported five of the top ten causes of death and disability in SA to be related to communicable, maternal, neonatal, and nutritional diseases, with HIV still the leading cause of death in the country.¹⁸⁶

It is well established that the South African HIV/AIDS epidemic is the largest, contributing approximately 17% of the total number of people living with HIV globally, despite having only 0.7% of the world's population.^{187-189,20,190,191} Between 2010 and 2019, SA's total HIV-infected population increased from 5.9 to 7.64 million.¹⁹² The high prevalence of HIV adds to the anaemia burden as well as the transfusion and healthcare challenges in the country as follows:

- (i) Anaemia is the most frequent haematological abnormality among patients living with HIV and is associated with HIV disease progression and a higher risk of mortality.¹⁹³
- (ii) Transfusion of blood infected with HIV and other diseases causes morbidity and mortality in recipients and has an economic and emotional impact on their families and communities.¹⁹⁴ Additionally, those who become infected through blood transfusion are infectious to others and contribute to the spread of disease throughout the wider population, thus increasing the burden on health services with a reduction in productive labour.¹⁹⁴

The high burden of diseases in SA, coupled with limited or slow interventions by the health ministry, contributes to an increase in complication rates – especially as patients often seek medical attention at an advanced stage of their disease.⁶⁵

2.8 PBM: A SOLUTION TO HEALTHCARE AND TRANSFUSION-RELATED CHALLENGES IN SOUTH AFRICA

2.8.1 High blood demand

In SA there is a high demand for and utilisation of blood transfusions across both private and public healthcare.^{20,92,195} This is attributed to the high prevalence of anaemia in surgical and non-surgical patients, along with the high prevalence of HIV and AIDS, tuberculosis, malaria, parasitic infestations, trauma and cancer in hospitalised patients.^{20,92,196}

A study on the evaluation of RBC utilisation patterns at the SANBS for the period 1 January 2014 – 31 March 2019 revealed that of the 2 356 441 transfusion events reported in the study period, 65.9% occurred in the public and 34.1% in the private sector.¹⁹⁷ It is of note that the private sector, which looks after 16% of patients, uses 34% of the blood. High blood usage is associated with widespread consequences for patients, clinical services, and blood services. It also magnifies healthcare costs.

2.8.2. Cost of blood

Blood is not only a scarce resource; it is an expensive medical treatment that contributes substantially to overall healthcare costs worldwide.^{6,198,199} While blood donation is voluntary, activity-based costs, starting with donor recruitment, blood collection, processing, distribution, pre-transfusion preparation, administration, wastage, adverse event handling, and long-term haemovigilance, are all complex and expensive undertakings.²⁰⁰ Improvements and additional safety measures, such as ID-NAT testing and pathogen reduction technologies, progressively add to the cost of blood.²⁰¹

Cost review studies in countries in Western Europe, the UK, USA, and Western Australia show blood costs running into millions of US dollars (USD) per annum.^{6,198,202-204} Although limited literature is available on the cost of blood in Africa and LMICs, in such settings, the high prevalence of disease imposes huge constraints on healthcare budgets.^{8,201} Providing safe and adequate blood for transfusion is, therefore, an expensive undertaking.^{8,201} Costs become further magnified as a result of screening, human resources, and blood manufacturing expenses that are wasted when donors test positive for HIV and other diseases.³⁸

A study on the cost of blood and blood products at the National Blood Service of Zimbabwe, showed that for the year 2013, the total unit costs of production were US\$118.42 for one unit of whole blood, US\$130.94 for one unit of RBC, US\$199.46 for one unit of FFP, and US\$76.09 for single donor whole blood derived platelets.¹⁹⁶ Overall, the total cost of producing blood and blood components in Zimbabwe in 2013 was 8.6 million USD. Activity-based costs included: blood donor recruitment and selection, donation collection, donation testing, component processing, storage and distribution, safety, health, environment, and quality (SHEQ) factors, as well as major costs for staff salaries, laboratory supplies, and clinic supplies.¹⁹⁶

PBM can sustainably and significantly improve the health status of the population, with the potential of enormous savings for the healthcare system in SA.²⁰ Even a modest reduction in blood usage can lead to significant savings in healthcare budgets, which could be allocated elsewhere.⁵ Rational blood usage based on clinically informed decision-making not only minimises unnecessary harm to patients, but it also maintains stewardship of altruistically donated allogeneic blood, helping ensure its availability for patients with the right clinical need for life-saving transfusions (e.g. in cases of obstetric emergencies).

2.8.3 Maternal mortality

The maternal mortality rate in LMICs, including SA, is high. According to the South African Department of Health's Saving Mothers report, the total number of maternal deaths in 2022 was 1 062.²⁰⁵ Obstetric haemorrhage, which accounted for 162 (16.7%) deaths, was the second most common cause of maternal death after COVID, and the primary cause of maternal death related to pregnancy.²⁰⁵

Figure 5, below from the DoH Saving Mothers report on maternal deaths and mortality rates (2022), shows the number of maternal deaths in SA for the period 1998–2022.²⁰⁵

Trends in Maternal Deaths and Maternal Mortality Rates

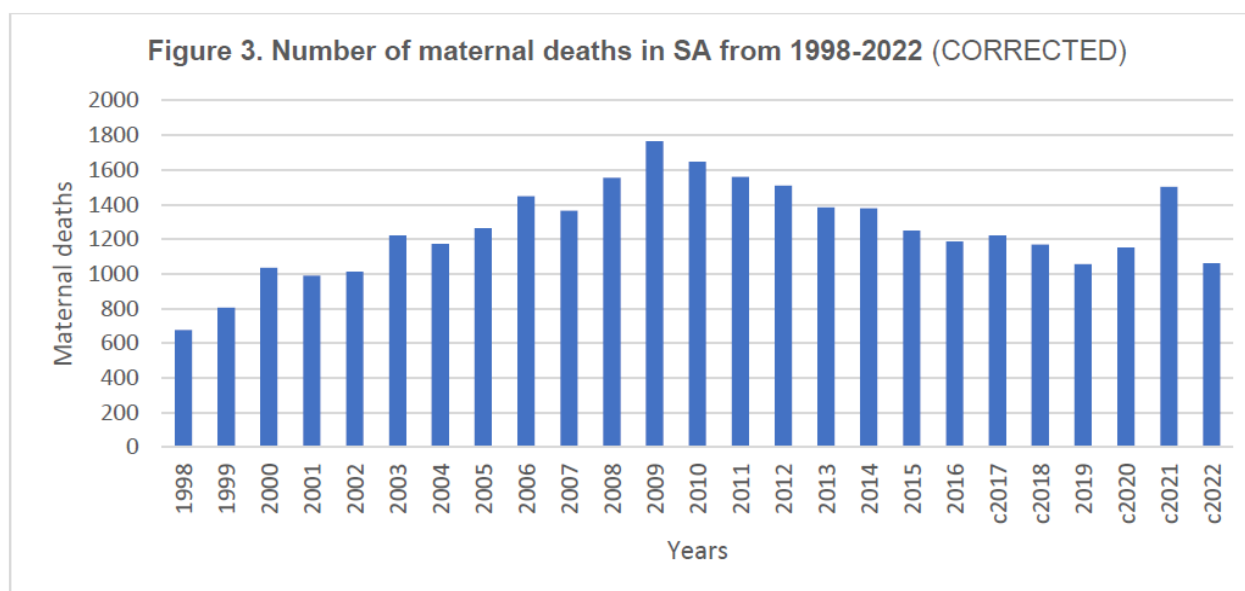


Figure 5: Trends in maternal death and maternal mortality rates in South Africa. From DoH: Saving mothers report, maternal deaths and mortality rates.²⁰⁵

Timely, appropriate and safe blood transfusion during and after labour and delivery can make the difference between life and death for many women and their newborns; however, the lack of access to safe blood for women reflects the general situation in developing countries.^{206,207}

The South African DoH is working towards the United Nations Sustainable Development Goal of reducing maternal mortality to below 70 per 100 000 live births and neonatal mortality to 12 deaths per 1000 live births.¹⁷ The broad aim is to reduce institutional maternal mortality, neonatal mortality and stillbirths by 50% by 2030.¹⁷

Important aspects of meeting this goal require multiple factors that include, but are not limited, to: (i) access to sufficient, secure supplies of blood and blood products, (ii) safe and efficient transfusion services, (iii) policies and procedures to guide the appropriate clinical use of blood and blood products, and (iv) protocols and clinical care pathways for the appropriate management of obstetric patients, including treatment of anaemia and ID early in pregnancy.

2.8.4 Blood supply challenges

There are substantial disparities in the availability and safety of blood between HICs and LMICs.²⁰⁸ According to the 2021 WHO Global Status Report on Blood Safety and Availability, of the estimated 118.54 million blood donations collected worldwide, 40% are collected in HICs, home to 16% of the world's population.¹¹³ The median blood donation rate in HICs is 31.5 donations per 1000 people, in contrast to the rate of 16.4 donations per 1 000 people in upper-middle-income countries, 6.6 donations per 1 000 people in lower-middle-income countries, and 5.0 donations per 1 000 people in low-income countries.¹¹³ A total of 60 countries report collecting fewer than 10 donations per 1 000 people. Of these, 34 countries are in the WHO African Region, four in the WHO Region of the Americas, four in the WHO Eastern Mediterranean region, four in the WHO European Region, five in the WHO South-Eastern Asia Region, and nine in the WHO Western Pacific Region. All are LMICs.¹¹³

In SA, less than 1% of South Africans are regular blood donors.²⁰⁹ Although the two blood services in SA persevere with extensive programmes to actively recruit new donors, the number of donors recruited may not always adequately compensate for the number of donors lost due to deferment

or illness. The high rate of blood donor deferrals due to the high prevalence of anaemia, high prevalence of HIV, and other frequently occurring diseases exacerbates the demand-supply challenges in the country.²⁰

Furthermore, diseases not tested for by blood establishments (e.g. malaria, cytomegalovirus, human T cell leukaemia virus, etc.) and potential future global infections that may be transfusion-transmitted magnify the potential risks to the blood supply, which is already on a knife's edge, particularly in LMICs.²¹⁰ Decreasing unnecessary blood transfusions by optimising and improving medical practice is a major approach to safeguarding blood supplies, which are both scarce and expensive.²¹¹

Figure 6 below provides a summary of healthcare and transfusion-related challenges in SA that could be eased by the implementation of PBM.

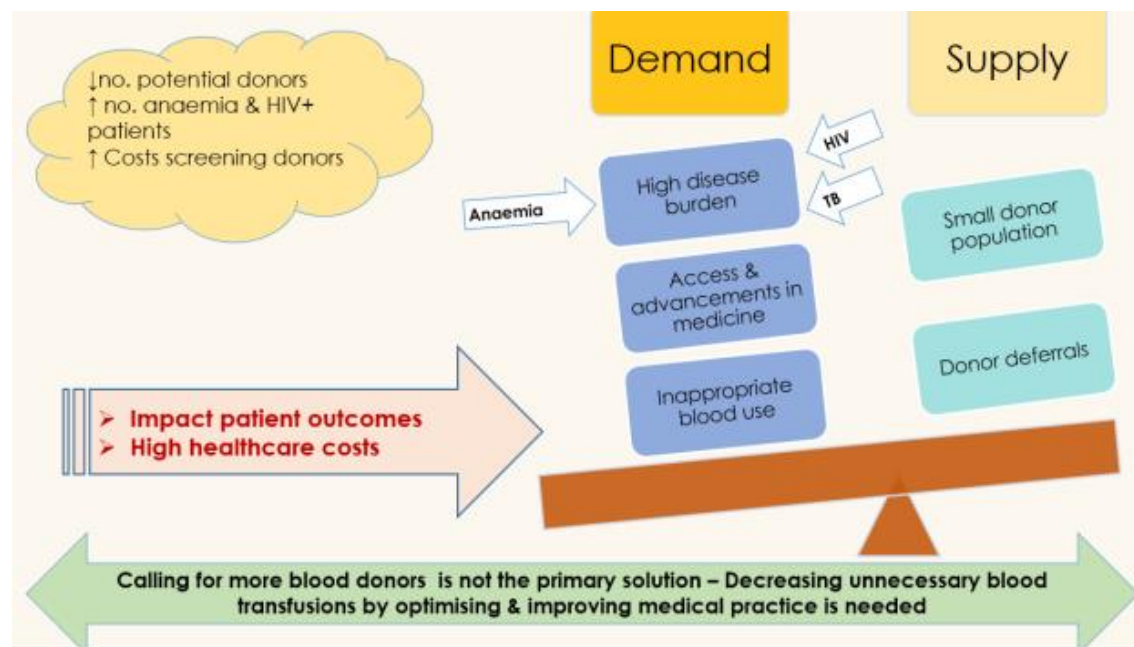


Figure 6: Summary of healthcare and transfusion-related challenges in SA that could be eased by the implementation of PBM (compiled by the researcher as part of this PhD research project).

The concern for SA and other LMICs is that blood supply-demand imbalances are expected to increasingly widen as the global population ages, and are thus vulnerable to sudden fluctuations in the need for blood, especially during disasters.²¹¹ The recent COVID-19 pandemic was a major health crisis that magnified blood supply challenges. During this period, the number of eligible donors decreased due to an increasing number of people becoming infected or going into self-quarantine after exposure to infected persons or persons under investigation.¹¹

Although elective surgical procedures were delayed during the pandemic, there remained a demand for blood in cases of emergency medical procedures, for patients on chronic transfusion programmes, and in situations of increased blood requirements, such as support for COVID-19 patients, especially those in critical care, patients with severe sepsis, or with a requirement for extracorporeal membrane oxygenation support.²¹²

Calling for more blood donors is not enough. The approach of doing and thinking needs to be corrected through active clinician education supported by guiding tools to correctly manage patients with anaemia and blood loss, not only in times of crises and blood shortages, but at all times.³⁸

2.9 CONCLUSION

This chapter contextualised the anaemia disease burden, its consequences, and the risks associated with the inappropriate use of blood transfusions in its treatment. It explained the pillars and principles of patient-centred, evidence-based PBM practices and presented the healthcare benefits gained from the implementation of PBM programmes in various countries. The chapter concluded with the healthcare and transfusion-related challenges in SA, to which PBM offers a practical solution.^{20,38} The next chapter will present the literature on the value of a toolkit in implementing PBM practices and the requirements/framework enabling the implementation of a PBM toolkit.

CHAPTER 3: PERSPECTIVES ON DEVELOPING A TOOLKIT TO SUPPORT THE IMPLEMENTATION OF PATIENT BLOOD MANAGEMENT

3.1 INTRODUCTION

The previous chapter laid the foundation for the importance of PBM implementation globally and in SA. Despite the evidence for improved patient outcomes, the economic advantages, and ethical and healthcare imperatives in favour of PBM, the overall adoption of PBM remains an unmet yet urgent need.^{16,17} This chapter outlines the barriers and challenges to PBM implementation and the value of a toolkit as a knowledge translation strategy to support the implementation of evidence-based PBM practices.

3.2 BARRIERS AND CHALLENGES TO PATIENT BLOOD MANAGEMENT IMPLEMENTATION

Several barriers limiting the translation of PBM principles into clinical practice have been reported at a global level.^{16,17,34,54,142,213} These barriers were identified through a systematic review of the literature.

Meybohm *et al.* outline the broad challenges as:³⁶

- lack of knowledge (e.g. staff members are not aware of EBPs and new guidelines, and imprudent practice is endorsed by common misconceptions),
- lack of interdisciplinary commitment (e.g. many patients have contact with different clinicians from different departments, with different opinions about the 'best treatment' and resistance from hospitals' culture), and
- lack of resources (e.g. limited staff with limited time, hospital administrators need to invest initially before saving money), and concerns (e.g. PBM may initially 'cut down' on jobs in blood transfusion services).

Sherliker *et al.* add that lack of resources (staff/facilities) and difficulties with engagement with hospital boards, senior managers, clinicians, and other stakeholders are common barriers to implementation.¹⁶⁶ Reluctance to develop new standard operating procedures (SOPs) and adopt new guidelines, and a lack of appropriate systems to monitor outcomes of changes implemented, are added challenges.^{34,142,213}

Findings of surveys conducted by the PBM working group of the European Blood Alliance highlight poor levels of PBM knowledge among clinicians, a lack of training, and hospital culture not being supportive of PBM, as common constraints faced in several European hospitals.^{35,50} Bisbe *et al.* explain that the broad scope of PBM programmes (multidisciplinary, multimodal, and applicable to many clinical procedures) and the long-lasting attitudinal and behavioural practices among healthcare professionals are barriers to practice change.⁵⁹

3.2.1 Low-and middle-income countries

Challenges faced in the low-resource areas of Africa and other low-income countries vary from one setting to another.⁵⁴ Examples include intrinsic human factors, such as inadequately skilled workers at the clinical interface, and extrinsic factors, such as poor financing and inadequate organisational and hospital quality systems to ensure safe transfusion practices.²¹⁴ Furthermore, competing priorities for health financing together with poor and incoherent health insurance systems pose major challenges in resource-limited settings.²¹⁵ Eichbaum *et al.* state that in LMICs inadequate resources to support PBM practices, such as intraoperative blood salvage devices, protocols, and unavailability of pharmacological and antifibrinolytic agents, and limitations such as poor internet connectivity, hamper access to available electronic educational support materials.⁵⁴

Hofmann *et al.* state that in SA, the lack of collaboration and communication with stakeholders, limited PBM experience, and a culture of strong belief in transfusions among clinicians are major barriers to PBM implementation in the country.¹⁷ Inadequate or limited clinical awareness of the risks associated with transfusion practice are added challenges.⁵⁴ Education on evidence-based transfusion practices is limited in most South African undergraduate and postgraduate medical training programmes.^{221,222,351}

Yudelowitz *et al.* report on their study describing the level of clinicians' knowledge of blood ordering and administration aspects for RBCs, FFPs, and platelets at a tertiary hospital in SA.³² Their study concluded that clinicians' knowledge of risks, resources, costs, and ordering of blood products was poor, advocating the important need for clinicians to have the competencies, skills, and knowledge to safely administer the limited and expensive blood products for the clinically appropriate patients.³² Changing the culture of transfusion practice through active education needs to feature high on the agenda of approaches to addressing the challenges facing blood services and clinical services in South Africa, and beyond.^{20,38}

The WHO lists the following four barriers that require urgent attention across all settings:¹⁶

- (i) Persistent lack of awareness about PBM on the part of patients, health authorities (including those responsible for universal health coverage), healthcare professionals (such as doctors, nurses, and pharmacists), professional societies, public health experts, health economists, hospital administrators, and others.
- (ii) PBM implementation is challenging due to the level of complexity and the need for managing an unusually large number of diverse stakeholder groups.
- (iii) Inclusion of PBM in universal health coverage is key to increasing and centralising health investments in PBM; however, such investments are often fragmented, siloed, and inefficient.

- (iv) The hold of existing medical dogma on culture and behaviour, and the entrenched position of transfusion as best care for anaemia and bleeding are continuing obstacles to the adoption and implementation of PBM.

3.3 IMPORTANT BARRIERS TO COUNTERACT

3.3.1 Silo practices

It is well established that health issues are characteristically broad and complex.²¹⁶⁻²¹⁹ Bridges *et al.* explain that many patients have complex health needs and typically require more than one discipline – that is, a multidisciplinary patient care approach – to achieve optimal outcomes.²²⁰ Munro adds that for decades we have been living in cultural and medical specialty silos, which has prevented recognition of important health issues, including the widespread effects of anaemia and ID on society.¹⁰¹ Breaking down silos by fostering a multidisciplinary approach is a key aspect of PBM, which recognises not only the value of collaboration between doctors within the various specialties, but also the role of nurses, pharmacy, laboratory, funders, etc.^{34,37,97,221}

3.3.2 Historic transfusion practices

Several experts concur that the implementation of PBM is hampered by the difficulty of changing traditional physicians' attitudes towards transfusion and transfusion behaviour.^{17,33,144,222,223} Doctors, who are familiar with the ease and established use of blood transfusion, may not appreciate the serious risk of transfusions nor the value of restrictive transfusion practices.⁵¹ The routine use of transfusion is thus a 'habit', and change is therefore limited by the clinical inertia of past practices that frequently impedes adherence.⁵¹ This is often accompanied by scepticism around the effectiveness of PBM.^{34,51,52} A clear understanding of PBM is needed to demystify misconceptions.

3.3.3 Lack of understanding of patient blood management

According to Hofmann *et al.*, an important barrier to the comprehensive uptake of PBM is not only the lack of trained personnel with expertise in PBM, but also misperceptions of PBM.¹⁷ They explain that many clinicians have been led to think that simply more judicious transfusion practice is PBM – yet this is not the case.¹³³

The goal of PBM is not reducing blood transfusions or restricting the use of transfusions or any other therapy *per se*.¹⁶ Rather than transfusion being a default decision based on a specified Hb concentration, PBM may pre-empt the use of blood transfusion by placing importance on the patient's own blood as a valuable resource, long before transfusion is even considered.²²⁴ A reduction in transfusions simply follows as a result of PBM.¹⁶

Preserving the patients' own blood, as well as conserving altruistically donated allogeneic blood through optimal or rational blood use, are both necessary. It is, however, important not to confuse 'What is best for the patient?' with 'What is best for the blood supply?'¹⁸ Isbister explains that tension exists between prioritising the patient's needs, which is the clinician's responsibility, and addressing the blood banker's and bureaucrat's concerns regarding the safety, sufficiency, cost-effectiveness, and conservation of the donor blood supply.¹⁸

PBM and blood conservation are not one and the same, and nor should they be seen as competing concepts; they are complementary strategies doing justice in different ways to donors and recipients of blood alike, with the overall common goal of improving patient and health outcomes.³⁸ Clinicians' focus should be on the patient and not the product.

3.3.4 Knowledge and education deficiencies

Fischer *et al.* state that a paucity of knowledge is a major obstacle to the success of PBM.³⁴ Principles of PBM and good clinical transfusion practice are absent or underrepresented in the undergraduate and postgraduate medical education and training of clinicians across many

institutions.^{28,29,32,225-227} These education deficiencies are evident in the treatment of anaemia and routine transfusion practices that are often inconsistent with the patient's clinical condition.⁴² Many clinicians are unaware of when and how to administer what treatment, such as oral iron and IV iron, including the follow-up that is needed.²²⁸ Furthermore, misconceptions surrounding the use of IV iron prevent its use as an effective therapy to correct ID in the right clinical circumstances.^{101,228}

Muñoz concurs that existing myths and perceptions among clinicians that IV iron is associated with substantial risk impede its use.¹⁰⁹ While it is true that early parenteral iron formulations were associated with a concerning adverse effect profile, newer formulations carry minimal risks, and the entire iron deficit can be made up quickly with one or two infusions, depending on the formulations used.¹⁰¹ Unfortunately, many clinicians remain unaware that these formulations are safe, effective, and rapidly administered.¹⁰¹ This, coupled with the knowledge deficit in acquiring approval for IV iron from health insurers, is a major factor limiting their use in the treatment of ID and IDA.¹⁰¹

In terms of preoperative anaemia, Shander *et al.* state that important concerns are the lack of a standardised, accepted definition of preoperative anaemia, and the lack of understanding of the important role of PBM in improving outcomes in surgical patients.⁵¹ They add that surgeons may not fully understand the clinical impact of anaemia, ID, transfusions, and their associated effects on postoperative recovery.⁵¹ Furthermore, there may be the perception that PBM may delay surgery and/or increase the risk of complications.⁵¹ Imprudent practices thus continue to be endorsed by non-evidence-based misconceptions, which need to be replaced by evidence-based alternatives that are beneficial for both patients and healthcare systems.¹⁰⁹

3.4 CLOSING THE GAP BETWEEN ACTUAL AND EVIDENCE-BASED PRACTICES

According to Roberts, “Weaning doctors off their love affair with blood is going to be harder than we think.”⁶ Evidence, however, indicates that through PBM, entrenched traditional transfusion practices can be progressively and sustainably substituted with recommended best practices.^{34,40,43}

Implementation requires a cultural shift across all levels of the healthcare system, which enables the replacement of the historic transfusion practice paradigm by evidence-based patient-focused practices.¹²⁸ Jackson and Shorr warn that “if we fail to change the paradigm, we do so to the profound detriment of patients.”²²⁹

Salbach advocates the need for knowledge translation as a means to bridge the gap between what is known from scientific research and how that knowledge, based on evidence, is transferred and used by the various stakeholders in the delivery of healthcare services.²³⁰

3.5 KNOWLEDGE TRANSLATION

Knowledge translation, defined by the Canadian Institutes of Health Research, is a dynamic and iterative process that includes the synthesis, dissemination, exchange, and ethically sound application of knowledge to improve health, provide more effective health services and products, and strengthen healthcare systems.²³¹ Knowledge translation serves as a vehicle to rapidly translate research evidence into health practice, which is critical to the effectiveness and sustainability of healthcare systems.²³² A major tie between knowledge translation and EBP is the importance of waiting for a body of evidence – that is, a sufficient number of studies supporting the same conclusion before using this information to change practice.²³⁰

It is now well established that PBM is an EBP. It is clearly defined as such by the WHO, SABM, International Foundation for Patient Blood Management (IFPBM), and other PBM experts.^{23,44,46,133,135} Furthermore, a growing body of evidence in the past decade affirms PBM as

an approach associated with significantly improving patient outcomes and safety, while reducing costs on a macroeconomic level.^{17,40-43,131} Translating knowledge of PBM into routine clinical practice thus becomes a healthcare imperative and a duty of care owed to patients.

One of the most consistent findings from clinical and health services research is the failure to translate research into practice and policy.²³³ Gaps between evidence, practice, and policy mean that patients do not fully benefit from advancements in healthcare and face undue risks of iatrogenic harm. As a result, healthcare systems incur unnecessary expenses, thereby being exposed to substantial opportunity costs.²³³ Thoele *et al.* state that the gap between scientific evidence and practice is potentially detrimental and must be closed to prevent morbidity and mortality in recipients of health.²³⁴

Although improved knowledge transfer or translation is essential, it is unlikely to be adequate on its own due to various barriers within healthcare systems, many of which function at levels beyond the influence of an individual practitioner.²³³ The main barriers to knowledge translation described by the WHO are: scientific uncertainty, institutional and legal structures, the media, political factors, and private sector interests.²³⁵ Grimshaw *et al.* explain that barriers may operate at other levels of a healthcare system and may include structural barriers (e.g. financial disincentives), organisational barriers (e.g. inappropriate skill mix, lack of facilities or equipment), peer group barriers (e.g. local standards of care not in line with desired practice), professional barriers (e.g. knowledge, attitudes and skills) and professional-patient interaction barriers (e.g. communication and information-processing issues).²³³ Barriers are often magnified in LMICs.²³⁶

The above-listed barriers resonate with earlier presented barriers to PBM. The WHO-advocated approaches listed below to improve knowledge translation in LMICs can therefore also be applied to PBM implementation.²³⁵

- (i) Provide training to improve the skills of decision-makers to interpret and understand scientific evidence.
- (ii) Engage stakeholders (including the community) in decision-making to promote the exchange of information between policymakers and the chain of command.
- (iii) Disseminate evidence in the form of short synthesis documents with a simple format and easy-to-understand language.
- (iv) Strengthen the capacity for local research.
- (v) Implement **tools (toolkit)** to promote evidence-informed policies and practices.

3.6 TOOLKIT: A KNOWLEDGE TRANSLATION STRATEGY

Toolkits are a knowledge translation strategy used to communicate messages or share decision aids, tools, or goods to improve health, educate, or change practice or behaviour among diverse populations, including patients, carers, clinical and managerial health professionals, policymakers, community and health organisations, and the health system.²³⁷ Toolkits essentially provide action-oriented guidance for practitioners or policymakers to apply research to their work.²³⁸

Toolkits are becoming increasingly popular for disseminating health information, building awareness, informing, and changing public and healthcare provider behaviour.²³⁷ They can be used alone or as part of a multi-strategy intervention, and hold promise as an effective approach for facilitating evidence use in practice and improving outcomes across a variety of disease states and healthcare settings.^{239,240}

3.6.1 Definition of a toolkit

Coined in the 1980s, the term 'toolkit' has been widely used to describe the bundling of a combination of educational materials geared towards knowledge sharing, educating, and/or facilitating behaviour change.²³⁷ A 'toolkit' is an action-oriented compilation of related information,

resources, or tools that together can guide users to develop a plan or organise efforts to conform to evidence-based recommendations or meet evidence-based specific practice standards.²³⁸

Toolkits are aimed at expediting the translation of evidence by providing the resources or guidance needed to execute a new practice, programme, or intervention.^{234,240} A 'tool' is an instrument that helps users accomplish a specific task that contributes to meeting a specific evidence-based recommendation or practice standard.²³⁸

Tools are usually documents developed by healthcare providers and leaders with the broad aim of providing information or guidance aligned with strategies that support the implementation of EBP.²³⁴ They are usually multiple adaptable resources that codify explicit knowledge, such as templates, instruction sheets, pocket cards, guidelines, algorithms, literature reviews, summaries, videos, and posters, presented in a variety of formats (hard copy and electronic).²³⁷ Tools may also be extended to educational meetings, educational outreach, the use of local opinion leaders, audit and feedback, and frequent reminders to cement knowledge transfer.²³³

A toolkit structure may comprise multiple categories of tools, with some tools able to meet multiple purposes.^{234,240} The toolkit structure described by the California Social Work Education Centre (CalSWEC) is recognised for its multiple implementation considerations.^{234,240} The CalSWEC toolkit structure incorporates the important need for champions, by in from stakeholders, flexibility to accommodate different settings and the use of multiple strategies to support to execute and support a new practice, programme, or intervention.^{234,240} It also serves as an introduction to the concept of a toolkit and implementation science by explaining the structure, function, and purpose of a toolkit's sections.²⁴⁰

Table 3 below provides an outline of the structure of the CalSWEC Toolkit.^{234,240}

Table 3: Outline of the structure of the CalSWEC Toolkit.^{234,240}

Tool	Purpose
Definitional tools	Define the intervention/s to be implemented: - Describe the problem, concern, or issue to be addressed. - Explain why and to whom the concern or issue is important. - Provide relevant background information. - Provide underlying theories and logic used in taking a particular approach. - Describe essential meanings, concepts, and philosophies. - Articulate the benefits of the intervention.
Engagement and communication tools	Communicate with stakeholders regarding the intervention and increase engagement in the implementation process. Tools may include introductory letters, flyers, brochures, fact sheets, talking points, advertising materials, important statistics, etc., to introduce the programme or intervention.
Assessment tools	Determine the current state, identify gaps and determine the necessary resources for successful implementation.
Planning tools	To prepare for implementation. Guide planning of action steps related to the implementation of the programme/ intervention.
Training tools	To educate stakeholders (target audiences) and may include: training materials, curriculum, talking points, presentations, etc., to aid transfer of learning in everyday practice.
Evaluation tools	Instruments to assess processes implemented and outcomes.
Policy and procedure tools	Documents to describe the standard processes or rules for operation.
Fiscal/funding tools	To provide information about financial resources or costs.

3.6.2 A patient blood management toolkit as a knowledge translation strategy for patient blood management implementation

Meybohm *et al.* state that strategies for overcoming hurdles to PBM implementation should include specifically designed “bundles of care” or tools appropriate for the local conditions, bundled in a way that is hospital-centred and compatible with each institution.³⁶ They advocate the stepwise selection of the most feasible country- or healthcare setting-specific bundles that support the implementation of the following PBM strategies:³⁶

- (i) Managing patients’ anaemia;
- (ii) Optimising coagulopathy;
- (iii) Interdisciplinary blood-conserving modalities;
- (iv) Optimal blood use with patient-centred decision-making; and
- (v) PBM-related metrics, patient outcomes, benchmarking.

3.6.3 Tools for a patient blood management toolkit

The IFPBM-SABM Workgroup recommends the need for diagnostic devices, treatment devices, pharmaceuticals, as well as SOPs and procedural guidelines as tools for the management of ID, anaemia, bleeding, blood loss, and coagulopathy.^{11,44} Developing and maintaining effective policies, procedures, protocols and checklists are essential tools to guide clinical practices and improve the quality of care.^{36,241}

Meybohm *et al.* state that SOPs are crucial for many aspects of a PBM programme. Clinical protocols, guidelines, visual aids, and checklists focusing on the strategies to be implemented must be available to the target users.³⁶ SOPs will facilitate implementation and practice changes and will ensure the sustainability of the programme.³⁶

The International Society for Blood Transfusion (ISBT) Clinical Transfusion Working Party conducted an international survey to identify PBM initiatives on a global level, and shared their findings on the tools required to improve PBM implementation across countries.²⁴² Among the 65 survey respondents (24 of whom came from LMIC countries), suggestions included the need for guiding protocols for transfusion thresholds, coagulopathy, major haemorrhage, preoperative anaemia management, blood conservation strategies, implementation of single-unit RBC transfusion policies, and management of transfusion reactions.²⁴²

The *Choosing Wisely* campaign, originally an initiative of the American Board of Internal Medicine Foundation, was designed to reduce the overuse of tests and procedures because they are unnecessary and therefore wasteful and potentially harmful.²⁴³ This campaign has also been adopted in the UK. The campaign comprises boxes of tools that may be used to engage with patients as well as doctors to help them choose care that is supported by evidence, preventing unnecessary harm.²⁴³

In light of the unnecessary use of blood transfusions as a common practice worldwide, an important aim of the Choosing Wisely campaign is to prompt clinicians to rethink their ingrained culture of liberal transfusion practices.^{6,243} Tools include patient empowerment tools (questions to ask your doctor before you get any test), recommendations on blood transfusion, and recommendations for the implementation of PBM (USA and UK).²⁴³

Tools advocated by the NHS to support the implementation of PBM strategies in the UK comprise a checklist of questions doctors should ask to determine the clinical readiness of patients for surgery, recommendations to avoid/reduce blood transfusions in surgical patients, management of anaemia and ID, use of blood conservation strategies, restrictive Hb thresholds, and single-unit red cell transfusions.²⁴⁴

The three-pillar, nine-field matrix of PBM presented in Figure 7 below was designed for the Western Australian PBM programme, to assist in the clinical implementation of multiple PBM strategies.^{40,128,131,163} The matrix encompasses strategies and tools to be considered in the perioperative period in a patient- and procedure-specific context. The principles of this matrix were also applied to nonsurgical patients before, during, and after treatment.⁴⁰

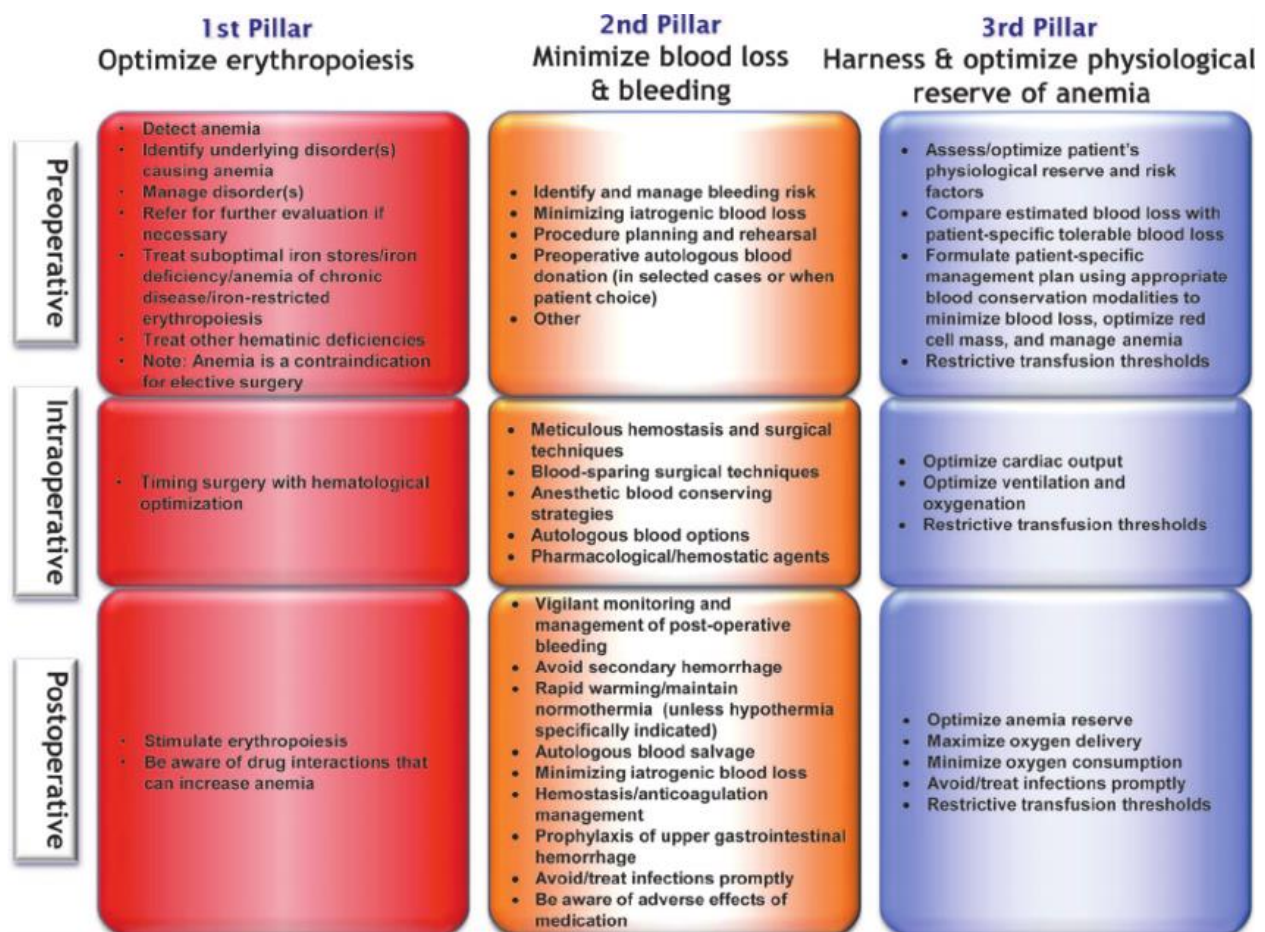


Figure 7: The three-pillar, nine-field matrix of patient blood management. Included with permission from the Western Australian Department of Health.⁴⁰

3.6.4 Essential (must-have) patient blood management tools

3.6.4.1 Tools to guide the diagnosis of anaemia

Due to the large range of causes of anaemia, a structured diagnostic approach is needed at an early stage of presentation. Establishing a definitive cause of anaemia is a critical starting point.²⁴⁵

It is also important to understand if anaemia is related to the patient's current condition and whether it can be corrected in the short term.^{18,246}

Although anaemia is frequently identified at the initial presentation, as the disease progresses, complications can arise, and more severe forms of anaemia may emerge, potentially necessitating prompt intervention.⁶⁵ While basic investigations suffice for most anaemic patients, the less common types of anaemia often require expertise and more specialised diagnostic tests and equipment.⁶⁵ Reaching a correct diagnosis of anaemia is paramount, as misdiagnosis can be costly to both the patient and the healthcare system.

A missed diagnosis caused by false-negative results from diagnostic testing can lead to patients not receiving treatment and subsequently presenting with complications. In contrast, an incorrect diagnosis due to a false-positive result may lead to unnecessary treatments or referrals for costly laboratory tests or interventions. This not only wastes valuable resources but also carries the risk of causing harm.²⁴⁷ Accurate and affordable tools for diagnosing anaemia and its main determinants are essential to selecting the appropriate interventions needed for its timely prevention and treatment.²⁴⁷

3.6.4.2 Iron deficiency

The diagnosis of IDA can be readily made by assessing Hb and serum ferritin levels.⁷⁹ Hb concentration alone is not a suitable indicator for assessing iron status or diagnosing ID. Hb is non-specific and not sensitive for ID; patients with NAID will therefore be missed. For this reason, specific measurements of iron status are required, such as serum ferritin and transferrin

saturation. Other markers (e.g. reticulocyte Hb content, serum soluble transferrin receptor, etc.) have been put forward as reliable indicators.²⁴⁷ Absolute ID/IDA (decrease of total body iron) is easily diagnosed based on decreased levels of serum ferritin and transferrin saturation.⁷⁸

Al-Naseem *et al.* state that the distinction between IDA and NAID relies on the use of strict Hb cut-offs; however, clinicians should consider the fact that normal Hb ranges have been set using population data.²⁴⁸ They add that what may be a normal Hb level for one person may be abnormal for another, especially if a patient has an Hb level in the low normal range but their usual Hb levels are higher.²⁴⁸

According to Munro the recognition of ID is impeded by the existence of inconsistent and highly variable local laboratory reference ranges – lower limits of normal are often even below the WHO criteria for ID (<15 ng/mL).¹⁰¹ Al-Naseem *et al.* state that patients suffering from ID should be treated, regardless of whether they are explicitly defined as anaemic.²⁴⁸ They claim that laboratory cut-off ranges are useful, but their limitations should be kept in mind and patients should be assessed on a case-by-case basis. Understanding the causes and clinical features of NAID is important and calls for greater awareness of the condition, advocating the need for diagnostic and management algorithms.^{78,248}

3.6.4.3 Management of anaemia

Anaemia management with iron (enteral or parenteral), haematinics, and with or without erythropoiesis-stimulating agents has been effective in a wide range of clinical settings.³⁹ Anaemia due to nutritional deficiencies can be effectively treated with oral or IV iron, B12, and folate.²⁴⁹ Oral iron is generally a readily available, inexpensive, effective, safe, and convenient first-line therapy for patients with uncomplicated ID.²⁴⁸ Munro adds that nutrition is a critical aspect of any strategy to preserve iron balance, oral therapy is therefore an essential therapeutic intervention for most of those affected by ID and related anaemia.¹⁰¹

While most ID patients are candidates for traditional treatment with oral iron, high hepcidin levels block its absorption in inflammatory disorders.^{78,248} Furthermore, oral iron is often ineffective because of poor patient compliance, typically related to gastrointestinal adverse effects such as nausea and constipation.¹⁰¹ These challenges can usually be mitigated by appropriate strategies such as low-dose daily schedules of elemental iron or alternate-day low-dose administration – approaches that many healthcare professionals may not appreciate or be aware of.²⁵⁰⁻²⁵²

Many clinicians are unaware of the typical response to oral iron therapy and the most appropriate follow-up protocols designed to assess for a proper response.²⁵³ If at least a 1 g/dL response is not seen by 2–4 weeks there is likely an issue with compliance or absorption.²⁵³ It is also essential to know that the endpoint of oral iron administration is defined by the return to normal Hb levels and the establishment of normal iron stores.¹⁰¹

IV iron is generally indicated for patients who are unable to tolerate or have an inadequate response to oral therapy, and those who require rapid restoration of iron stores for imminent surgery, or are in the second or third trimester of pregnancy.^{101,228} Individuals administering IV iron should have knowledge of IV iron administration, including a pre-infusion assessment to evaluate infusion reaction risks, pre- and post-infusion monitoring, identification and management of infusion reactions, accurate documentation of these reactions, and laboratory monitoring.²²⁸ As with oral iron administration, the Hb response should be monitored after 2 weeks, and the patient re-assessed if there is no response. The value of an early reticulocyte response should also not be overlooked.

3.6.4.3.1 Women's health

Given that HMB is the most common cause of ID in women, identification and appropriate treatment are logical steps to improve both the quality of life in the woman and the outcomes for the foetus.¹⁰¹ The high prevalence of anaemia in women of reproductive age in LMICs warrants

policies that include early diagnosis and efficient treatment of pathologies requiring transfusion (e.g. early management and prevention of ID and anaemia), and the use of surgical techniques and medications aimed at limiting blood loss cannot be underestimated.²⁵⁴

The application of such practices can decrease the need for blood transfusions and reduce the percentage of maternal deaths. In pregnancy, early screening and correction of ID with or without anaemia is essential to decrease maternal and foetal morbidity and mortality.³⁸ Early treatment with oral or IV iron, continued follow-up and monitoring of patients are practical solutions to addressing anaemia early in pregnancy, avoiding patients being anaemic at delivery, and not having the margin of reserves to protect them should massive bleeding occur.³⁸

3.6.4.3.2 Surgical patients

Shander explains that there is an urgent need for healthcare providers to fully recognise the deleterious effects of preoperative anaemia and the risks associated with perioperative blood transfusion, and to integrate multimodal PBM strategies into routine care for patients undergoing surgery.⁵¹ Murhey and Palmer advocate that preoperative anaemia be diagnosed and treated at the earliest opportunity before elective surgery.²⁵⁵

Approaches to consider include preoperative optimisation of Hb, management of comorbidities and medications that may increase bleeding or limit it, intraoperative blood preservation techniques, and careful postoperative patient support to optimise anaemia tolerance and minimise further blood loss.²⁵⁶ To decrease the exposure to allogeneic blood transfusion, a reduction in perioperative blood loss is important, and this reduction may be achieved through the pre-, peri- and postoperative management of pharmacological adjuvants that decrease bleeding and pharmacological alternatives to stimulate erythropoiesis and increase oxygen transport.²⁵⁷

The National Institute for Health and Care Excellence (NICE) on blood transfusion provides recommendations for the use of erythropoietin, oral iron, IV iron, cell salvage, and tranexamic acid; the choice of which modality to use must be evaluated against the individual patient's clinical status.²⁵⁸

Preoperative anaemia should be detected well in advance of elective surgery and treated using effective measures that reduce the requirement for blood transfusion and improve the quality of care.⁵¹ Oral iron should be first-line therapy if there is sufficient time to obtain an effect before surgery (>6 weeks). Shander *et al.* recommend standardised algorithms for the definition and treatment of preoperative anaemia in elective surgery, to avoid reliance solely on Hb levels as a trigger.⁵¹ Meybohm *et al.* add that there should be local SOPs for preoperative management of coagulopathy, which should include questionnaires/tests of haemostasis, algorithms for bridging in patients with preoperative anticoagulants, and antiplatelet medications.³⁶

3.6.5 Tools to guide appropriate transfusion practices

Policies for the appropriate clinical use of blood are not available in many African countries.¹² According to Fischer *et al.*, transfusion decisions are highly complex and affected by many factors, ranging from a sincere but often unsubstantiated desire to maintain health, and ensure and accelerate patients' recovery, to an arbitrary phobia of any legal consequences.³⁴ Blood transfusions should not be based on Hb levels alone. Indications for transfusion should take into consideration patient-specific factors (e.g. age, diagnosis, comorbidity), laboratory values (e.g. Hb, platelet count, coagulation testing), presence or absence of bleeding, and physiologic factors (e.g. oxygenation, hemodynamic status).³⁶

When RBC transfusion is clinically indicated in the non-bleeding patient, only a single unit should be prescribed, followed by clinical reassessment of the patient.²⁵⁵ The optimal strategy for

transfusion – restrictive versus liberal – in patients with chronic haematologic disorders is not known, and a patient-centred approach is advocated while research is ongoing.^{259,260}

To encourage clinically appropriate transfusion practices, as far back as 2002, the WHO advocated the need for:²⁶¹

- “Development of a national policy and guidelines on the clinical use of blood;
- Training in the clinical use of blood for all clinicians involved in the transfusion process and for Blood Transfusion Service staff commitment to the prevention, early diagnosis and treatment of conditions that could result in the need for transfusion (obstetrical complications, trauma, gastrointestinal or perioperative blood loss, etc.);
- Availability of intravenous replacement fluids for the correction of hypovolaemia;
- Availability of pharmaceuticals and devices to minimise the need for blood and decrease blood loss, especially in the perioperative setting;
- Effective clinical use of blood and blood products in accordance with national guidelines and
- Monitoring and evaluation of the clinical use of blood.”

In response to challenges encountered with maintaining adequate blood supplies during the COVID-19 crisis, Shander *et al.* published a “call for action” document emphasising the essential role of PBM in the management of pandemics, urging all to implement the practical and common-sense principles of PBM and its multi-professional and multimodality approaches.¹¹

They advocated the following clinical care strategies:¹¹

- Identify, evaluate, and treat ID and anaemia in both medical and surgical patients with appropriate pharmacological agents.
- Identify and rapidly address coagulation/haemostatic issues perioperatively.
- Use all effective blood conservation methods in both medical and surgical patients.
- Carefully monitor patients’ condition after surgery and rapidly intervene for unexpected bleeding by either interventional radiology or endoscopy, depending on the source.

- Thoroughly inform and educate medical professionals, patients, and their caregivers on the importance of PBM; involve patients in treatment and management decisions and obtain formal consent.

These strategies should be applied not only during crises and pandemics, but at all times.³⁸ Procedures and protocols are essential to guide clinically appropriate transfusion decision-making and to ensure consistent and sustained practices.

3.6.6 Laboratory testing and access to appropriate treatment such as intravenous iron

Reducing the prevalence of anaemia globally, particularly in LMICs is an important goal for health outcomes.²⁶² According to Munro, IDA and especially ID are underdiagnosed in LMICs and high-resource countries.¹⁰¹ Several issues impair the diagnosis of ID and IDA, perpetuating the existence of untold millions if not billions of under- or untreated individuals worldwide.¹⁰¹ Garcia-Casal *et al.* state that assessment of anaemia is often difficult in low-resource settings due to a lack of or poor maintenance and calibration of equipment, limited access to reagents or trained laboratory personnel, unreliable electricity, as well as logistical challenges.²⁴⁷

In resource-challenged countries, budgetary constraints limit the scope of investigations and management options.⁶⁵ The diagnostic approach to laboratory testing may therefore differ, depending on the available diagnostic resources. Some methods for measuring Hb and detecting the common causes of anaemia are expensive or not immediately available in PHC settings in resource-limited countries where anaemia is most prevalent.^{52,247}

Abdullah *et al.* add that some countries in the Asia region lack access to laboratory testing, such as iron studies, to diagnose ID. They explain that in certain settings, such tests come as an added cost to the hospitals, and blood is therefore perceived as being a more readily available ‘free’ treatment option for anaemia. Furthermore, testing only the patient’s Hb and neglecting to

ascertain other RBC parameters, such as the platelet count, white cell count, differential count, etc., can lead to misdiagnoses and inappropriate treatment.

Access to equipment that can improve efficiencies in diagnosis and care is a serious challenge in some countries. A survey conducted in China showed that from 2006 to 2009 only 20% of patients in level three (tertiary level) hospitals had their Hb or haematocrit concentrations tested before transfusions, and out of 43 hospitals only 13 (30%) had equipment for point of care (POC) intraoperative Hb and haematocrit measurement.⁵⁴ Garcia-Casal *et al.* recommend the need for more accurate and accessible field-based diagnostic and POC screening, diagnostic and monitoring tools, especially for settings where there is no access to a well-equipped laboratory.²⁴⁷

Benites *et al.* explain that in the current age of increasingly specialised and expensive medical procedures, such as laparoscopy and robotic-assisted minimally invasive surgeries, these advanced techniques are not widely accessible in resource-limited countries like Brazil and elsewhere.⁴² Furthermore, the majority of their public sector hospitals cannot afford technologies that have the potential to minimise the unnecessary use of blood components. In fact, they lack basic elements that could positively influence PBM. Medications like erythropoietin are only available in the public system for anaemia secondary to chronic kidney disease, and IV iron is not freely available in the public sector.⁴²

Spahn explains that health insurance coverage for anaemia treatment varies worldwide and within individual countries in terms of access to and availability of non-transfusion alternatives such as IV iron, erythropoietin, and other pharmaceuticals.²⁶³ With regard to IV iron, several barriers exist across both HICs and LMICs, and these include access issues related to cost, insurance coverage, and health system policy.¹⁰¹ Shander *et al.* concur that in several countries IV iron is not readily available, or the use of IV iron is not reimbursed, or reimbursement is limited to certain medical/surgical indications, while each transfusion is separately reimbursed.⁵¹

3.7 IMPLEMENTATION OF PATIENT BLOOD MANAGEMENT SUPPORTED BY A PATIENT BLOOD MANAGEMENT TOOLKIT

3.7.1 Implementation science

Implementation science refers to “the scientific study of methods to promote the systematic uptake of research findings and other EBPs into routine practice to improve the quality and effectiveness of health services.”²⁶⁴ Implementation science draws on the use of theories, models and frameworks, and was born out of a desire to address challenges associated with the use of research to achieve more EBPs in healthcare.²⁶⁵

Frameworks provide a broad set of constructs that organise concepts and data descriptively without specifying causal relationships.⁵⁶ They also provide a prescriptive series of steps summarising how implementation should ideally be planned and carried out.⁵⁶ They do not specify the mechanisms of change; they are typically more like checklists of factors relevant to various aspects of implementation.²⁶⁵ Once the broad framework is developed, the immediate and long-term evidence-based interventions can be mapped, and the appropriate tools tailored to support the implementation.

To address the gap between evidence and practice, Powell *et al.* recommend the following strategies to support the implementation of evidence-based interventions:²⁶⁶

- Identification of champions,
- Assessment for adoption readiness,
- Identification of barriers, and
- Promotion of the adaptability of the intervention.

To achieve the intended outcomes, strategies that are implemented must be able to bring about the desired behavioural and practice changes.

3.7.1.1 Behavioural change

A key element in the implementation of EBPs depends on successful behaviour change interventions.²⁶⁷ Michie states that improving implementation depends on changing the behaviour of health professionals, managers, commissioners, and others working within and with the healthcare system.²⁶⁸ Handley *et al.* add that behaviour change is inherent to the translation of evidence into practice, policy, and public health improvements.¹²⁹ They explain that in most situations, an evidence-practice gap exists because individuals or organisations are not doing something that is recommended.¹²⁹

Achieving and maintaining behaviour change within the ethical and practical constraints that typically operate remains a formidable challenge.²⁶⁸ Fisher *et al.* state that the key to successful initiation and maintenance of large-scale behavioural change is the understanding of what motivates medical professionals and the belief that healthcare professionals are generally motivated to make the right decisions.³⁴ Their experience with implementation of PBM interventions in Germany yielded successful outcomes through large-scale behavioural change education initiatives aimed at influencing knowledge, attitude, and behaviour.³⁴

3.7.1.2 Education is key

Education is a comprehensive term defined as “the process of receiving or giving systematic instruction” or as “an enlightening experience.”²⁶⁹ Knowledge is defined as “facts, information, and skills acquired by a person through experience or education.”²⁶⁹ Knowledge is the desired outcome of education.²⁶⁹

In a scoping review of programmes designed to build capacity and capability for knowledge translation in healthcare settings, King *et al.* report that education was the most frequently described strategy that was delivered in conjunction with other strategies to implement EBPs. They claim that education is the cornerstone of capability building in knowledge translation.²³²

In implementing PBM interventions in various countries, the need to increase knowledge and awareness of the clinical implications of anaemia, best practice treatment approaches, prioritising patient outcomes, alternatives to transfusion, inappropriateness, cost, and blood supply issues featured as common threads across the literature.^{34,36,42,51,54,131,245}

Education and training strategies to support implementation in several countries included:

- Hospital training programmes to facilitate PBM programme execution.^{34,42,131}
- PBM education for doctors, nurses, medical students, and new hospital residents.^{42,131}
- PBM education for GPs.¹³¹
- Clinician education directed at the risks of preoperative anaemia, tolerance of anaemia, indications for blood transfusions, and correcting the belief that anaemia is appropriately corrected with RBC transfusions.^{34,131}
- Lectures on the adverse effects of uninformed or poorly informed transfusion decision-making practices presented in all departments, with monitored obligation for physicians and nurses to attend lectures.⁴¹
- Live teaching sessions during departmental ward rounds coupled with group and individual teaching sessions for increased exposure to encourage the use of bedside educational materials and checklists.^{34,132}
- On-call transfusion medicine specialists providing clinical decision-making guidance.⁴²
- PBM national educational series in Australia.¹³¹
- Local online PBM and general transfusion practice certification course in Germany.³⁴
- Electronic systems for physician education. Alerts generated when unusual/non-compliant transfusion orders are registered. This allowed for consultation, guidance, and education for blood prescribers.^{42,52,132}

- Monitoring of blood usage and clinician feedback on blood utilisation patterns provided opportunities for education, better accountability, and improved practices as a result of individual/departmental blood usage being compared to the usage of their peers.¹³²
- Patient education initiatives, such as dietary guidance to improve iron intake, advice on increasing the interval between pregnancies and treating comorbidities.⁵²

Empowering clinicians with the right knowledge and the right mix of educational and clinical practice tools can counteract outdated concepts and practices and replace them with EBPs, which not only protects patients but also clinicians and the healthcare profession at large.⁵⁴ Fischer *et al.* emphasise that early education along with easily accessible evidence-based protocols and SOPs aimed at supporting clinical judgement and guiding clinical practices should be the cornerstone of patient care.³⁴

In light of PBM being a multidisciplinary care paradigm, education should be extended to all involved in the chain of care, such as nursing, pharmacy, laboratory administrative staff as well as patients.^{34,42,131} Farmer *et al.* concur that in implementing PBM aggressive education strategies need to be adopted, enabling all stakeholders – including patients and all clinical and non-clinical hospital staff – to be fully informed of EBPs, risks and benefits of transfusion, along with measures to correct anaemia, and minimise blood loss, and the use of appropriate alternatives.¹²⁸

3.7.1.3 Patient education

According to the WHO, PBM in its broadest sense is a public health imperative requiring patient and community engagement.²⁷⁰ Professor John Murphy (Chicago Professor of Surgery, 1857–1916) aptly positions the role of patients in healthcare by stating that *“the patient is the centre of the medical universe around which all our works revolve and towards which all our efforts tend.”*¹³⁶

Empowerment of patients is key in addressing long-standing acceptance and tolerance of treatable health conditions. An appropriate example provided by Munro is the existence of a pervasive societal aversion to discussing menstruation and its disorders.¹⁰¹ As a result many women lack awareness of the difference between normal and heavy bleeding, often due to social, cultural, or religious practices.¹⁰¹ The normalisation of HMB by society, families, healthcare professionals, and reproductive-aged girls and women is a significant barrier to diagnosing and treating this often debilitating symptom.¹⁰¹

It is important for patients to be informed about health risks such as HMB, anaemia during pregnancy, preoperative anaemia, etc., and that with treatment their recovery and overall health outcomes can be improved.^{52,101,133,136} Isbister *et al.* state that when patients enter the healthcare system, by choice or otherwise, aspects of their life become medicalised, monetised, legalised, and controlled.¹³⁶ They add that patients do not want to be a featureless cog in what may appear to be a convoluted, fragmented, and confusing medical system with a shaky moral compass.¹³⁶

Hofmann *et al.* also emphasise the importance of developing awareness of PBM at a patient and public level by providing education on the risks and benefits of all treatment options, including transfusion for anaemia, blood loss, and coagulopathy as part of proper informed consent and shared decision-making.¹⁷ They add that involving, educating, and collaborating with patients may reduce the demand for blood transfusion and also reduce the risks of litigation.^{17,258}

However, education alone may not always be enough to bring about practice changes. In addition to the education of clinical stakeholders and patients, additional support mechanisms that facilitate the integration of knowledge into everyday practice are often necessary.

3.7.1.4 Education alone is not enough

Arlinghaus states that education is a necessary component for behaviour change; however, on its own, it is not sufficient.²⁶⁹ In sharing their lessons learned with PBM implementation in Western Australia, Gallagher *et al.* explain that in their initial PBM programme design, it was anticipated that the education of clinical staff would be sufficient to initiate and maintain changes in clinical practice.¹³¹ However, their experiences revealed that clinician willingness to change practice alone was insufficient – additional supporting environmental factors and tools were also needed. These included corrected workflows, including patient flow pathways to optimise anaemia management, availability of pharmaceutical alternatives to transfusion, technologies that reduce the need for transfusion or guide transfusion decisions, such as thromboelastography (TEG), cautery and cell salvage devices, and electronic systems to order tests, and to collect, monitor and report transfusion usage data.¹³¹

Duarte *et al.* add that the implementation of clinical guidelines to promote education among physicians is essential – but an insufficient measure to guarantee their correct use.²⁷¹ They state that for a PBM programme to reach its full potential a broad approach is needed, with continuing medical education, preoperative anaemia management, bleeding-adapted surgical techniques, a multidisciplinary peri-operative team, and an integrated clinical decision support system with best practice alerts.²⁷¹

Warner *et al.* based their PBM programme implemented in a large medical centre in the USA on three key activities which collectively yielded successful outcomes:⁵³

- (i) Educating providers on the importance of minimising allogeneic transfusion and increasing blood health;
- (ii) Implementing evidence-based guidelines and developing electronic decision support systems to direct appropriate transfusion; and

- (iii) Developing a transfusion data analytics platform to monitor patterns in transfusion practices, recognising areas for improvement.

3.7.1.5 Practice-monitoring tools

Regarding the PBM programme implementation in Germany Fischer *et al.* share a similar sentiment and add that having the appropriate knowledge and attitude is necessary, but not sufficient for adherence.³⁴ Data collection, benchmarking, and reporting, as well as infrastructure measures to support implementation, are therefore necessary.^{11,44} Models using medical auditing associated with transfusion protocols and physician feedback can improve care practices and thereby optimise patient clinical outcomes and minimise the need for transfusions.

Mehra *et al.* reported that in their hospital setting in Switzerland, the initial establishment of transfusion and coagulation management guidelines was largely inefficacious.⁴¹ Although lectures on the adverse effects of inappropriate transfusions were presented to all departments with a monitored obligation for physicians and nurses to attend, they claim that they may have introduced these guidelines with insufficient collateral activities.⁴¹ Their message is that implementation requires proactive communication as well as measures to show how well guidelines are being followed. In their setting, implementing a PBM monitoring and feedback system was found to be highly efficacious in bringing about practice changes.⁴¹ Audit, monitoring and feedback on blood usage patterns in hospitals in Brazil, Germany, and Australia also yielded positive behavioural change outcomes.^{34,40,42,131,158,163}

Having the infrastructure and supportive tools, which include but are not limited to equipment, staffing, screening tools, guiding policies and procedures, therapies for anaemia management, and measures to monitor adherence, is necessary to pave the way toward helping physicians make evidence-based decisions.³⁴

Handley, Gorukanti and Cattamanchi advocate the following three key principles that should be applied in a stepwise approach to improve the process of implementation and close the evidence-practice gap.¹²⁹

- (i) **Pre-implementation planning** by engaging stakeholders and making the case for evidence translation,
- (ii) **Implementation strategy design** by using behavioural theory/frameworks to identify barriers and facilitators to guide the development of implementation strategies, and
- (iii) **Implementation strategy evaluation** by employing rigorous evaluation designs to determine whether strategies to reverse the gap are effective and why or why not.¹²⁹

Table 4 below provides a summary of implementation strategies applied in various countries, which can be linked to the three phases of implementation.

Table 4: Implementation strategies applied in various countries, grouped into the three phases of implementing evidence-based practices.

Pre-implementation planning	
▪ Obtaining a mandate for PBM from hospital management.^{36,131,243} ▪ Buy-in and commitment from multidisciplinary teams (clinicians, laboratory technicians, administrative, quality management personnel, blood service, etc.).^{36,37,131} ▪ Multidisciplinary blood transfusion committee/PBM steering committee.^{52,131} ▪ Strong PBM thought leadership to foster a broader country-wide acceptance and change.⁵⁴	
Implementation strategy design (<i>Tools needed to guide EBPs</i>)	
▪ Setting up infrastructure and resources: Preoperative anaemia clinic.¹³¹ Pharmacological: - iron therapy (oral and IV iron).^{34,36,37,41,42,52,54,131} - tranexamic acid.¹³¹ - human prothrombin complex.¹³¹ - erythropoietin-stimulating agents.^{52,131} - fibrinogen.¹³¹	

Technological:

- Cell salvage equipment.¹³¹
- Point of care (POC) testing to measure laboratory parameters even at remote sites, and to view patient results in real time for efficient decision-making.¹³²
- Thromboelastography and cautery.¹³¹
- Computerised physician order entry (CPOE) for ordering of blood and blood products, with alerts to flag orders not compliant with recommended guidelines.⁴¹
- Minimising tissue injury during surgical operations.⁵⁴
- Promoting endoscopic surgeries.⁵⁴

Other:

- Smaller blood tubes for laboratory analysis.³⁴
- Standardisation of allogeneic blood product transfusion.³⁴
- Developing and implementing policies and guidelines to facilitate coordinated and homogenous activities across hospitals:
 - Reducing unnecessary transfusions and transfusion vigilance.¹³¹
 - Single-unit transfusion.¹³¹
 - Reducing unnecessary blood sampling.¹³¹
 - Massive haemorrhage.¹³¹
 - Evidence-based transfusion triggers.¹³²
 - Optimal/rational use of blood and blood products.^{34,132}
 - Restrictive transfusion thresholds.³⁴
 - Tranexamic acid use.⁴¹
 - Blood bank procedures.⁴¹
 - Modalities of transfusion (surgical reserve and emergency transfusion).⁴¹
 - Management of transfusion reactions.⁴¹
 - Single-unit RBC transfusion^{52,131}
- Education and training for clinical staff.^{36,37,131 36,131,243 54}

3.7.2 Implementation considerations for low-resource settings

In light of infrastructure, staff, equipment, and economic resources differing greatly between hospitals worldwide, individualisation is vitally important for the acceptance of any new standard.^{36,272} Countries and hospitals therefore need to be cognizant of the resources they have available to initiate a locally feasible PBM programme, as not all countries have the readiness to implement multiple interventions at once. It is therefore necessary to consider which approaches to optimise practice should be supported, or which interventions should be considered best value for money.²⁷³ As an example, Uganda has a fairly well-developed national Ugandan Blood Transfusion Service; however, a weak link lies in the poor clinical interface and communication between prescribing clinicians and the Blood Service.⁵⁴

Certain approaches and tools such as robust audit systems, electronic decision support systems, blood-conserving technologies, etc., come with cost, infrastructure, and capacity demands. Other strategies and tools are, however, relatively less challenging yet affordable to adopt (e.g. single-unit transfusion policy, reduction of volume and frequency of blood testing, increased use of tranexamic acid, and treatment of common causes of anaemia such as ID using affordable nutrient supplementation).³⁵ Abdullah *et al.* advise that implementing PBM Pillar One by using iron replacement therapy to optimise red cell mass in patients with ID is a sensible first step, regardless of healthcare setting.⁵²

In SA, Alli *et al.* advise the need for innovative approaches, such as sharing resources and expertise between centres, having streamlined referral systems, and developing guidelines specific to the South African healthcare context.⁶⁶ They state that this would be a step towards standardising anaemia treatment aligned to protocols, taking into consideration resource constraints with feasible solutions.

3.7.3 Getting all on board with champions

Implementing PBM requires liaison and partnership between all personnel and organisations, including Blood Service authorities.⁵¹ Handley *et al.* emphasise that engagement with a range of individuals and stakeholder organisations is imperative to achieve effective translation and sustained improvement in implementation outcomes.¹²⁹ They claim that a fundamental premise is that stakeholders have credible, intimate, and necessary understanding of concerns, values, assets, and activities of their environment; their input and buy-in are therefore valuable.¹²⁹ It is therefore essential to communicate with and bring on board all clinical staff and necessary stakeholders to strengthen trust and commitment to PBM.¹⁷

Abdullah *et al.* state that PBM champions such as national health authorities and/or blood services, professional medical organisations, hospital administrators and, crucially, physicians are pivotal in promoting PBM implementation.⁵² Hofmann *et al.* recommend having a senior-level PBM champion who is responsible for planning, organising, and directing PBM, supporting specialists, ensuring continuous data collection, reporting, benchmarking, and using the data to stimulate competition and motivation among clinicians to excel in PBM.¹⁷

The Western Australian implementation experience reported that the engagement of clinical staff members who become their department's 'PBM champions' played a key role in disseminating the PBM culture throughout the hospital.¹³¹ Champions provide strong leadership needed to sustainably establish effective programmes and create collaborative environments for healthcare professionals across surgical, medical, transfusion medicine, nursing departments, laboratory, and pharmacy.^{17,52} They can also serve as custodians for PBM guidelines, communication tools and education.^{52,213}

3.8 CONCLUSION

The urgency for implementation is undeniable.¹³³ While each country may face different challenges in implementing PBM, the concept is applicable everywhere.⁵² Notwithstanding its urgency, the implementation process should proceed in a stepwise manner that is appropriate to the healthcare setting and acceptable to stakeholders.⁵² A broad framework of strategies and tools can offer adaptability and flexibility to guide the development of a PBM toolkit tailored to the needs of specific healthcare settings. This chapter presented the barriers and challenges to PBM implementation and the potential value of a toolkit as a knowledge translation strategy to address some of the key barriers. The next chapter describes the research design applied in this study to identify the essential and practical measures that need to be included in a framework for a PBM toolkit appropriate for the South African healthcare context.

CHAPTER 4: RESEARCH METHODOLOGY

4.1 INTRODUCTION

Chapter 3 outlined the barriers and challenges to PBM implementation and the value of a toolkit as a knowledge translation strategy to support the implementation of evidence-based PBM practices. This chapter describes the research methodology applied in collecting and analysing the data that ultimately informed the PBM toolkit framework. The chapter begins with the theoretical perspectives of the research design and methodologies, followed by a description of the mixed-method approach, the research instruments used, the data collection methods, and the data analysis processes. The chapter concludes with the ethical considerations that were applied and the factors that contributed to the trustworthiness of the study.

4.2 THEORETICAL PERSPECTIVES ON RESEARCH DESIGN AND METHODOLOGIES

The qualitative research paradigm refers to the “generic research approach in social research according to which research takes its departure point as the insider perspective on social action.”²⁷⁴ Such research is appropriate when studying people’s attitudes and behaviours, and processes in their natural settings.²⁷⁴

Qualitative research explores and provides deeper insights into real-world problems by gathering data on participants’ experiences, perceptions, and behaviour.²⁷⁵ It answers the questions of ‘how’ and ‘why’ rather than ‘how many’ or ‘how much’.²⁷⁵ It is an iterative process in which improved understanding is achieved by the scientific community by making significant new distinctions as a result of getting closer to the phenomenon under study.²⁷⁶

Mouton explains that studies that are qualitative in nature aim to provide in-depth descriptions of people or communities.²⁷⁷ Polkinghorne explains that the distinguishing features of qualitative research include a reliance on words rather than numerical data, and it employs meaning-based

rather than statistical forms of data analysis.²⁷⁸ The tradition of using qualitative methods to study human phenomena is grounded in the social sciences.²⁷⁹ It is used to explore, uncover, describe, and understand what lies behind any phenomenon about which perhaps little is known.²⁸⁰ Cypress explains that this methodological revolution has made way for a more interpretative approach, because aspects of human values, culture, and relationships are not described fully using quantitative research methods.²⁸⁰

In contrast, quantitative research is a process that is systematic and objective in its ways of using numerical data from only a selected subgroup of a population to generalise the findings to the population being studied.²⁸¹ According to Henning, the focus in a quantitative study will be on the control of all of the components in the actions and representations of the participants; the variables will be controlled, and the study will be guided by an acute focus on how the variables are related.²⁸² In this setting, the respondents or research subjects are usually not free to express data that cannot be captured by the predetermined instruments.²⁸²

Henning states that in a qualitative study, the variables are usually not controlled because it is exactly this freedom and natural development of action and representation that we wish to capture.²⁸² This freedom allows the researcher to understand and also explain in argument what the phenomenon or phenomena that are being studied are about, by using evidence from the data and the literature.²⁸² This deeper understanding of the phenomenon in its specific context can be attained only through qualitative inquiry, not through the mere numbers and statistical models provided using a quantitative approach.²⁸⁰

Unlike quantitative researchers, who seek causal determination, prediction, and generalisation of findings, qualitative researchers allow for the phenomenon of interest to unfold naturally and strive to explore, describe, and understand it, and delve into a colourful, deep, contextual world of interpretation.^{283,284}

According to Borgstede and Scholz, qualitative and quantitative research strategies have long been treated as opposing paradigms; however, in recent years, there have been attempts to integrate both strategies.²⁸⁵ These ‘mixed-methods’ approaches treat qualitative and quantitative methodologies as complementary rather than opposing strategies.^{286,287}

4.3 RESEARCH DESIGN AND METHODOLOGY

The research design refers to the overall strategy that one selects to integrate the different components of the study in a coherent and logical way, thereby ensuring that the research problem is addressed effectively.²⁸⁸ Research methodology is defined as a strategy or architectural design that the researcher uses to map out an approach to problem-finding or problem-solving.²⁸⁹ It is a comprehensive strategy that silhouettes our choice and use of specific methods, relating them to the anticipated outcomes.²⁹⁰

In order to have diverse opinions and views, qualitative findings need to be supplemented with quantitative results.²⁹¹ In this study, a mixed-method research design was applied to achieve the specific objectives and overall aim of the study. Research using mixed methods is where the researcher mixes or combines research methods’ theories (e.g. use of qualitative and quantitative viewpoints, data collection, analysis, and inference techniques) into a single study.^{292,293}

In using a quantitative approach one looks for relationships between variables, while by using the qualitative approach one seeks an in-depth understanding of individuals’ experiences.²⁸¹ The combined research approach adds breadth and depth of understanding and corroboration, with the overall goal being to expand and strengthen the conclusions of a study.^{292,293}

A multi-layered approach comprising quantitative and qualitative components, which included a detailed literature review, one-on-one semi-structured interviews, and a Delphi survey, was used independently and in combination to achieve the overall aim of this study.

A detailed review of the literature formed the foundation of the study. This was aimed at achieving the first objective of the study, which was to gain a perspective on the PBM implementation experiences of countries across the globe regarding strategies and tools that were implemented, challenges and barriers encountered, outcomes achieved, and educational needs deemed necessary for clinicians and other healthcare partners.

The interviews were directed at achieving the second objective of the study. They provided in-depth insights on the PBM champion participants' experiences with implementing PBM interventions in their respective healthcare settings, and what they felt were the essential PBM tools and educational aspects needed to support PBM implementation in SA. Their suggestions and recommendations were critical in constructing the comprehensive list of statements that were subsequently tested for consensus by an expert panel in the Delphi survey.

The Delphi survey, a semi-quantitative method, was applied to achieve the third objective of the study. The survey was used to gain validation through consensus from PBM experts on the essential, feasible, cost-effective, evidence-based tools for a PBM toolkit appropriate for South African hospitals. The Delphi process started with qualitative data collection through the literature review and the interviews, which led to the development of the questionnaire for the Delphi survey. The quantitative aspect of the Delphi process allowed for calculating the level of agreement or convergence among experts and reaching consensus through iterative feedback.

In this study, the qualitative component provided the researcher with deep insights and information about the PBM champions' views of the importance of PBM implementation in SA, their experiences (i.e. successes and challenges encountered) with implementing PBM interventions, and what they felt were the essential educational components and guiding tools needed to support PBM implementation in hospitals. The quantitative component of calculating the level of consensus on the suggestions and recommendations derived from the interviews

enabled the development of a validated framework for a PBM toolkit, to serve as a template or guide to support the implementation of PBM in South African hospitals. The qualitative and quantitative research methods applied in this study were therefore appropriate.

4.4 DATA COLLECTION METHODS AND PROCEDURES

Figure 8 below provides a summary of the data collection strategy that was applied in developing a framework for a PBM toolkit appropriate for the South African healthcare context.

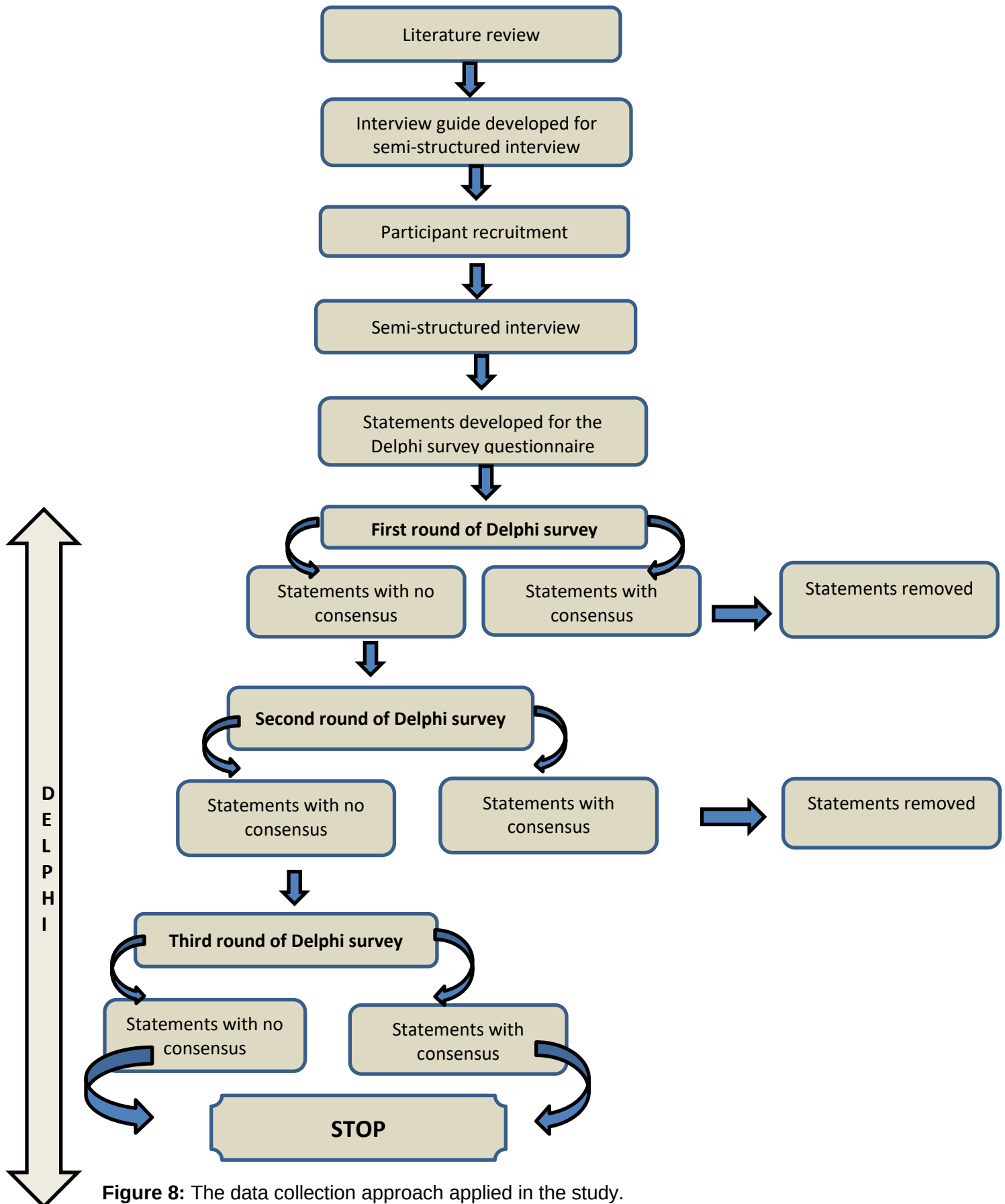


Figure 8: The data collection approach applied in the study.

4.4.1 Literature review

Maggio, Sewell and Artino define a literature review as “a synthetic review and summary of what is known and unknown regarding the topic of a scholarly body of work, including the current work’s place within the existing knowledge.”²⁹⁴ The aim of a literature review is to contextualise a problem against related theory and research, while also ensuring that the researcher is sufficiently knowledgeable about the field of investigation.²⁹⁵

First a detailed review of the literature was conducted to contextualise the study and to gain a deeper insight into the status of PBM implementation across the globe, the tools and strategies applied, benefits gained in the respective countries, challenges and barriers encountered, how these were overcome, and the overall lessons learned. It was also endeavoured to gain an understanding of the educational gaps and needs of clinicians and others that must be addressed for the successful implementation of PBM programmes. A critical review of the literature thus provided a starting point and a guiding template for PBM implementation strategies, resource needs, potential support tools, and educational focus considerations to support the implementation of PBM in SA.

This information collectively provided an extensive background and context for the research problem. Furthermore, it informed the development of the interview guide for the one-on-one semi-structured interviews with the PBM champion study participants and contributed to identifying some of the key criteria in terms of requirements for a PBM toolkit that were subsequently tested in the Delphi survey.

The literature search was conducted by searching the PubMed database using Medical Subject Headings (MeSH). MeSH is an organised vocabulary system produced by the National Library of Medicine (NLM) and is used for indexing, cataloguing, and searching for biomedical and health-related information.⁶⁴ MeSH includes the subject headings appearing in MEDLINE/PubMed, the

NLM Catalog, and other NLM databases.⁶⁴ Subject headings that were used in the search included: 'patient blood management' [MeSH], 'blood transfusion' [MeSH], 'anemia, iron deficiency' [MeSH], 'evidence-based medicine' [MeSH], 'care management, patient' [MeSH], 'biomedical ethics' [MeSH], 'blood loss, surgical' [MeSH], 'bloodless medicine and surgery programs' [MeSH], and 'perioperative care' [MeSH].

The search was refined by adding filters such as publication date, study type, population, and language. Publications for the period 1995 to 2025 were reviewed. The review excluded conference proceedings and abstracts. Publications were assessed for relevance to the aim and objectives of the study, and those that were relevant were included. Further articles were sourced from references cited in the literature, which were deemed relevant to the study. Preference was given to peer-reviewed international and national journals. The search was also expanded to include recognised websites of regulatory and advisory bodies such as the WHO, the SABM, and the IFPBM.

4.4.2 One-on-one semi-structured interviews

Interviews are among the most familiar strategies for collecting qualitative data.²⁹⁶ Qualitative interviews aim to see the world through the eyes of the participant and to obtain rich descriptive data that will help the researcher understand the participants' construction of knowledge and social reality.²⁹⁷ If the participants feel that the topic is important, they will provide information that one may not be able to collect in any other way.²⁹⁷

Semi-structured interviews are those in-depth interviews where the respondents have to answer preset open-ended questions and are thus widely employed by different healthcare professionals in their research.²⁹⁸ The interviews are based on a semi-structured interview guide, which is a schematic presentation of questions or topics that need to be explored by the interviewer.²⁹⁶

To achieve optimum use of interview time, interview guides serve the useful purpose of exploring the opinions of many respondents more systematically and comprehensively, as well as keeping the interview focused on the desired line of action.²⁹⁶

In this study, an interview guide was developed and used to facilitate the semi-structured interviews (*Appendix B: PBM Champions Interview Guide*). The interviews were directed at medical professionals, mainly doctors, actively involved with PBM implementation in hospitals across SA. The broad aim of the interviews was to explore their experiences as PBM champions in terms of what they had/were implementing, and the challenges and outcomes they encountered in their respective settings. Based on their hands-on involvement with PBM, the interviews were aimed at identifying what the PBM champions felt were the tools and educational support needs that were essential for the effective implementation of PBM practices in SA.

The data collected from the interviews was used to develop a comprehensive list of criteria in the form of statements that were subsequently tested and validated in the Delphi survey. Overall, the open-ended nature of the semi-structured interviews generated rich qualitative data that provided deep insights into the phenomena that were being explored, making the one-on-one semi-structured interview a suitable research method for this study.

4.4.3 The Delphi survey

The term 'Delphi' originated from ancient Greek mythology and was believed to be the precinct of Pythia (a major oracle), where prophecies were made to dictate and direct vital state affairs.²⁹⁹ The Delphi technique was originally developed by the Rand Corporation for technological forecasting.^{300,301} It is now widely used among the health professions, as well as social and political science as a method to achieve consensus on research or policy questions.^{301,302}

According to Nasa *et al.*, the Delphi process has been used in diverse areas of healthcare, examples of which include evaluating current knowledge, resolving controversy in management, formulating theoretical or methodological guidelines, developing assessment tools and indicators, and formulating recommendations for action and prioritising measures.²⁹⁹

The Delphi technique facilitates an efficient group dynamic process through an anonymous, written, multi-stage survey process.³⁰³ It is a semi-quantitative data collection approach and is valued for its ability to structure and organise group communication in gaining consensus among a panel of experts in an iterative fashion.³⁰⁴ Consensus refers to a general agreement among the group of experts participating in the survey. According to Larson and Wissman, consensus is reached when 80% of participants indicate a similar value (for a specific item) as their choice.³⁰⁵

The Delphi approach comprises rating the importance of items presented in the respective statements, and consensus is achieved through a series of rounds (usually three). The use of successive questionnaires in the Delphi process allows opinions to be considered in a non-adversarial manner, with the collective opinion being repeatedly fed back.³⁰¹ The primary purpose is to generate a reliable consensus opinion of a group of experts through an iterative process of a questionnaire interspersed with controlled feedback.³⁰⁶ The questionnaire contains feedback about the answers given by the same expert panel from the previous round of the questionnaire.³⁰⁷

In this study an online Delphi or e-Delphi was used to survey a panel of experts to elicit their opinions on a list of criteria in the form of statements directed at tools recommended for a PBM toolkit. The criteria included the educational deficiencies that need to be bridged and the barriers and challenges that need to be addressed for the effective implementation of PBM programmes or interventions in primary, secondary, and tertiary-level hospitals in SA. The data collected from

the literature review and the one-on-one semi-structured interviews with the PBM champion participants were used to develop the statements for the Delphi survey.

The survey in this study was developed and powered using commercially available web-based software. There are several advantages to using such software in that they are usually quick to set up, relatively low in cost, and provide a high level of data security.³⁰⁸ SurveyMonkey® was selected for the e-Delphi process as it was user-friendly for the researcher in terms of ease of use in the development and layout of the survey as per the researcher's requirements, and the availability of a link through which the participants could easily access the survey. It was also user-friendly for the study participants in terms of ease of use for completing the survey.

The online Delphi offered multiple benefits, which included:

- A quick and efficient approach to developing the survey for each round and ease in distributing it to individual participants. Rounds two and three of the survey were each created by electronically editing the previous survey and removing the statements on which consensus had been reached.
- Cost-effectiveness in that the researcher's employer provided access to the licence for use of the SurveyMonkey® software tool. The method was also time-effective in that it enabled quick turnaround times, yielding results without the need for face-to-face interactions with participants.
- Offering participants the freedom to access the survey anywhere, and at any time via any digital device (mobile phone, tablet, laptop, or desktop computer).
- Generation of electronic data on the participants' responses that could be filtered to meet the analytical requirements of the researcher. This expedited the data review and analysis process and prevented lengthy delays after each round of the survey, thus enhancing the continuity of the Delphi process.

Overall, the Delphi survey participants had the opportunity to select their responses without undue pressure, and by receiving feedback after each round they had the opportunity to reflect on their opinions and reconsider their responses in the subsequent rounds.

Lastly, both qualitative and quantitative approaches were combined in using the Delphi technique, which made this a suitable research method for developing the PBM toolkit framework.

4.5 SAMPLE SELECTION

Purposive sampling was used for the semi-structured interviews and the Delphi survey. This means that the participants were selected because of some defining characteristic that made them holders of the data needed for sampling.²⁹⁷ Purposive sampling is widely used in qualitative research for the identification and selection of information-rich cases related to the phenomenon of interest.³⁰⁹

Purposive sampling strategies are based on the assumption that, given the aims and objectives of the study, specific kinds of people may hold different and important views about the ideas and issues in question and therefore need to be included in the sample.^{310,311} The reason for purposive sampling is better matching of the sample to the aims and objectives of the research, thus improving the rigour of the study and the trustworthiness of the data and results.³¹⁰

4.5.1 The semi-structured interview

Participants for the semi-structured interviews were purposively selected based on the fulfilment of specific criteria relating to their involvement with PBM.

4.5.1.1 Description of sample and inclusion criteria

In this study, PBM champions who worked in South African hospitals were identified and invited to participate in one-on-one semi-structured interviews. In the context of this study, a PBM champion was defined as a healthcare professional actively involved in creating PBM awareness and/or implementing PBM interventions in their clinical setting/s.

The importance of champions for healthcare change efforts is well established; they are known for their influence, ownership, physical presence at the point of change, persuasiveness, grit, and participative leadership, all of which contribute to a champion's ability to drive implementation outcomes.³¹² PBM champions thus represent change agents for clinical practice improvement, and their involvement in promoting and implementing PBM practices made them ideal participants as they held the data needed for this study.

The sample population therefore, included healthcare professionals who had active involvement in creating PBM awareness and/or implementing PBM initiatives in hospitals. The aim was to have representation of participants from a variety of PBM-related disciplines, from both the public and private healthcare sectors across the country.

To identify potential participants, a comprehensive list of PBM champions working in, or who had worked in hospitals across SA, was compiled with input from the PBM medical consultants at the SANBS, WCBS, and the SSA PBM working group. The SSA PBM group was formed in 2018 and comprises healthcare professionals with a keen interest and involvement in promoting and supporting PBM implementation in SSA. Also, snowball sampling, which is a purposeful method of sampling in qualitative research, was achieved as the initial targeted participants referred the researcher to other participants, and those participants referred the researcher to further potential participants.³¹³ This continued until the desired sample size was achieved. Participants were ultimately selected and enrolled based on predetermined inclusion criteria.

Participants had to:

- be a healthcare professional actively involved in creating PBM awareness and/or implementing PBM practices in South African hospitals,
- have a minimum of two years' involvement with PBM but a minimum of 10 years' experience as a healthcare professional,
- have worked in one or more of the PBM-related specialties (surgery, anaesthesiology, internal medicine, family medicine, obstetrics or gynaecology, paediatrics, critical care), or in general practice with a PBM focus.

In developing the framework for a PBM toolkit, the PBM champions were the ideal holders of information in terms of what tools a toolkit should comprise and how best the tools should be packaged for practical utility. Furthermore, the PBM champions had direct insight into the South African healthcare environment regarding the barriers, challenges, and resource needs, including the educational deficiencies that have to be addressed among clinicians. They were therefore the ideal participants for this study.

4.5.1.2 Sample size

Qualitative research usually involves smaller sample sizes and sampling is flexible and often continues until no new themes emerge from the data collection process; this is referred to as reaching data saturation.²⁸¹ The sample size is adequate when the topic is fully explored and there is clarity on meanings.³¹⁴

In this study, a total of eighteen PBM champions were identified and formally invited to participate in the semi-structured interviews. Sixteen PBM champions who had worked in hospitals across six of the nine provinces in SA accepted the invitation and were interviewed. The sample size in this study was appropriate based on the two guiding principles for qualitative sampling explained by Botma.³¹⁵

- (i) the sample participating in the study needs to be appropriate, meaning that they can provide useful data in response to the research problem; and
- (ii) the sample must be adequate, meaning the sample of participants can produce sufficient data for the researcher to be able to discuss findings and draw conclusions in response to the research problem.

Adequate information was obtained from the interviews conducted, with data saturation. There was therefore no need for additional interviews.

4.5.1.3 Pilot study

A pilot evaluation of the interview guide was conducted to determine the suitability and adequacy of the interview questions. This was done to ensure that the questions were scientifically and grammatically clear and to determine how much time would be needed to conduct the full interview. To achieve this, digitally recorded virtual interviews using the Zoom videoconferencing platform were conducted with two individuals who met the inclusion criteria defined for the study population. No changes to the interview guide were suggested by the pilot participants. Based on this, the two pilot study interviews were included for analysis together with the collective sample of interviews conducted.

4.5.1.4 Data collection

The study participants were formally invited via email to participate in the one-on-one semi-structured interview. The email provided the details of the study and included the *Participant information pamphlet and informed consent document (Appendix A: Participant information pamphlet and informed consent document)*. Written informed consent was obtained from the participants before conducting the interviews. The semi-structured interviews were facilitated using the pilot-tested interview guide which comprised 12 open-ended questions.

The interviews were scheduled at a time that was convenient for the participants and were conducted via videoconferencing using *Zoom*. The interviews were conducted by the researcher, and the duration of the interviews ranged from 60 to 90 minutes each. The interviews were audio-recorded for transcription with permission from the participants.

4.5.2 The Delphi survey

Delphi participants are not selected randomly – they are purposefully selected to apply their knowledge and experience to a certain issue, based on criteria that are developed from the nature of the problem under investigation.³¹⁶ Participants for the Delphi survey were purposively selected based on the fulfilment of specific criteria relating to their involvement with PBM.

4.5.2.1 Description of sample and inclusion criteria

The selection of criteria that would qualify an individual to participate in the Delphi panel depends on the context, scope, and aims of the particular study.³¹⁷ According to Ziglio some of the general criteria include:³¹⁷

- (i) knowledge and practical engagement with the issue under investigation,
- (ii) capacity and willingness to contribute to the exploration of a particular problem, and
- (iii) assurance that sufficient time will be dedicated to the Delphi exercise.

A series of statements compiled from the review of the literature and analysis of the findings of the semi-structured interviews were presented to and independently rated by a selected panel of PBM experts who worked in South African hospitals. An expert in the medical and healthcare context is defined as “a person widely recognized as a reliable source of skill or knowledge whose faculty for judging or deciding rightly, justly or wisely is accorded authority and status by their peers or the public in a specific well-distinguished domain.”³¹⁸

In the context of this study, a PBM expert was defined as a healthcare professional who is a leader and advocate for PBM awareness and implementation, and a provider of education, guidance, and advisory support for PBM initiatives. Participants for the expert panel were identified in consultation with and with guidance from the PBM medical consultants at the SANBS, the WCBS, and the SSA PBM working group.

Participants were selected based on the following inclusion criteria, and had to:

- be active role-players in guiding and leading PBM education awareness and implementation interventions,
- have a minimum of three years of involvement with PBM and a minimum of 10 years' experience as a healthcare professional, and
- be advisors for PBM implementation in LMICs.

The researcher initially planned to include PBM experts from HICs as part of the expert panel; however, it was decided to exclude these participants as they would not have the direct knowledge and practical experience of the infrastructure and resource challenges that exist in South African hospitals. The expert panel for the Delphi survey therefore included individuals who had worked in and had active involvement in leading the implementation of PBM interventions in SA. This sample included one international participant who was based in the UK but had worked in South African hospitals for several years and was successful in implementing PBM interventions at a tertiary-level hospital in SA.

4.5.2.2 Sample size

There is no agreement on the panel size for Delphi studies, nor recommendations on or unequivocal definition of 'small' or 'large' samples.^{316,319} The number of panel members varies from 10 to 1000 (typically 10–100) in published studies.²⁹⁹

A total of 12 PBM experts were identified and formally invited via email to be part of the expert panel for the Delphi survey. Eleven participants accepted the invitation and were included in the Delphi panel.

4.5.2.3 Pilot evaluation

A pilot evaluation of the questionnaire for the Delphi survey was conducted to ensure that the questions were clear and the survey was well structured. The evaluation was also done to test the electronic survey platform (SurveyMonkey®), to determine its suitability in terms of access via the survey link, ease of navigating through the survey via the digital platform, and the amount of time that would be needed to complete the survey. To achieve this, two medical doctors with knowledge of and experience with PBM were asked to complete the survey via the electronic link to establish ease of use and identify any problems with the statements in the questionnaire. The data from the pilot evaluation was not used in the results of this study. The final criteria for the survey were formulated with the guidance of the researcher's study supervisors.

4.5.2.4 Data collection

Individual letters (*Appendix C: Letter inviting participation in the Delphi survey*) were forwarded via email to the study participants. The letter explained the aim and objectives of the study, the Delphi survey process, what would be expected of the participants, and the estimated amount of time that would be needed for completion of each round of the survey.

Three rounds of the Delphi survey were conducted in this study. Each round of the survey commenced with the researcher sending the survey link and a letter providing detailed information on what was expected of the participants in that round. A three-point Likert scale rating system was applied, where the participants had to rate the statements as 1 – Essential, 2 – Useful, and 3 – Unnecessary.

Each statement in all three rounds of the survey was accompanied by a comment box to allow participants to include their thoughts, opinions, and experiences, or to seek clarity or ask questions about the statement. Statements for which consensus was achieved were removed from the subsequent round of the survey.

The participants were provided with feedback after each round of the survey. Providing feedback informs the group of the current status of their collective opinion and helps to identify items that they may have missed or thought unimportant.³⁰¹ According to Keeney *et al.* it is only through seeing the (anonymous) responses from other panel members that participants are encouraged to reconsider their views.³²⁰

The feedback provided included the statements on which consensus was obtained, the overall percentages of participant responses to statements on which consensus was not obtained, and the researcher's comments and responses to comments and questions raised by individual participants. Two weeks were allocated to the participants for completing each round of the survey. After the first week, a reminder email was sent to the individual participants who had not completed the survey. No further reminders were required.

4.6 DATA ANALYSIS

4.6.1 Semi-structured interview

According to Maree, qualitative data analysis is usually based on an interpretive philosophy, which tries to establish how participants make meaning of a specific phenomenon by analysing their perceptions, attitudes, understanding, knowledge, values, and experiences in an attempt to approximate their construction of the phenomenon.²⁸¹ This is best achieved through a process of inductive analysis of qualitative data, where the main purpose is to allow the research findings to emerge from the frequent, dominant, or significant themes inherent in the raw data.²⁸¹

A process of inductive analysis was applied by following a systematic approach, starting with the transcription of the data. The audio recordings of the semi-structured interviews were transcribed verbatim by an independent transcriptionist who was not involved with the study. The researcher verified the transcriptions by listening to the audio recordings and checking the transcriptions for correctness. The researcher then coded and thematically analysed the data using the NVivo qualitative data analysis software.

Thematic analysis seeks to unearth the themes salient in a text at different levels.³²¹ When analysing qualitative data the aim is to summarise what you have seen or heard in terms of common words, phrases, themes or patterns that would aid in your understanding and interpretation of that which is emerging.²⁸¹ Coding is the first step in thematic analysis, the aim of which is to reduce the data by dissecting the text into manageable and meaningful text segments.³²¹

The data was coded by looking for specific words and texts through which themes were identified, organised, and grouped into specific categories. The thematic analysis process was carried out carefully and cautiously, to make sure that by summarising and categorising the data the researcher did not in any way change the meaning of responses collected from the participants. The themes extracted and categorised from the coding of the interview data was captured in a table. This data together with the data collected from the literature review were used to construct the statements that were subsequently rated for consensus by the PBM expert panel in the Delphi survey.

4.6.2 Delphi survey

The data collected from each round of the Delphi survey was analysed by the researcher. In this study consensus on statements was deemed to be reached when 80% of the participants' votes fell within the same bracket on the Likert scale.

In developing the broad framework, statements rated ESSENTIAL by 80% or more of the Delphi survey participants were included as essential elements. Statements rated less than 80% for any one category, but 80% and more for ESSENTIAL and USEFUL combined, were collectively categorised as '*at least useful*' in the framework.

Statements for which stability was achieved were also considered for the framework. Stability in a Delphi survey refers to "the consistency of responses between successive rounds of a study."³²² It is described as the natural tendency for opinions of experts to centralise after a series of rounds. In this study, stability was deemed to be achieved when 20% or less of the participants changed their responses after feedback was provided. This applied to cases where no consensus was achieved.

Finally, in constructing the overall framework for the PBM toolkit, the CalSWEC toolkit structure was used as a guiding resource as it comprised comprehensive considerations for the effective implementation of healthcare interventions, including the use of champions, networking, stakeholder engagement, onboarding, assessing implementation readiness, ability to adapt strategies and interventions to suit various settings, the use of multiple strategies to support implementation and ultimately evaluate outcomes.^{234,240}

4.7 TRUSTWORTHINESS, RELIABILITY, CREDIBILITY, AND VALIDITY

To be relevant, research – whether quantitative or qualitative – must be trustworthy.³²³ Trustworthy qualitative research findings are known to be important for informing policy decisions and improving the provision of services in various fields.³²⁴

Trustworthiness refers to the way in which the inquirer is able to persuade the audience that the findings in the study are worth paying attention to and that the research is of high quality.³²⁵

In simple terms, trustworthiness can be referred to as the “believability” or the credibility of the results.³²⁶ According to Korstjens and Moser, credibility refers to the confidence that can be placed in the truth of the research findings.³²⁷ It establishes whether the research findings represent plausible information drawn from the participants’ original data and are a correct interpretation of the participants’ original views.³²⁷

Reliability is the extent to which a procedure produces similar results under constant conditions on all occasions, meaning that the research instruments used and procedures or methodologies applied should produce the same results under the same conditions.³⁰¹ Ahmed explains that establishing reliability in qualitative research is crucial for influencing future research paths and advancing cumulative knowledge.³²⁴

Researchers thus have a responsibility to ensure that procedures have been adhered to and, where possible, confounding factors are eliminated to produce reliable results.³²⁸

Validity in qualitative research means “appropriateness” of the tools, processes, and data.³²⁹ It is the extent to which an instrument or procedure satisfies the purpose for which it was constructed. It takes into consideration whether the research question is valid for the desired outcome, the choice of methodology is appropriate for answering the research question, the design is valid for the methodology, the sampling and data analysis are appropriate, and finally the results and conclusions are valid for the sample and context.³²⁹

Measures applied to ensure the reliability, validity, credibility and overall trustworthiness of the findings of this research study are detailed below:

- Purposive sampling was applied to specifically recruit participants who had the relevant knowledge and background appropriate for the study. Furthermore, strict inclusion criteria were used to recruit the study participants. According to Becker and Roberts choosing

participants who are knowledgeable about and interested in the topic helps to increase the validity or strength of the conclusions drawn from the findings.³³⁰

- The interview guide that was developed and used in the semi-structured interviews was informed by the literature review.
- The interview guide for the semi-structured interview and the Delphi survey questionnaire were pilot-tested before implementation to determine their suitability and appropriateness in this study. Pilot testing of the research instruments enhanced the validity of the study.
- All the interviews were conducted by the researcher using a consistent approach and the same interview guide in a consistent format.
- The interview recordings were transcribed verbatim by an independent individual who was not in any way involved with the study.
- Typed transcriptions of the interviews were verified for correctness by the researcher. This was achieved by the researcher listening to the audio recordings and checking the accuracy of the written transcripts.
- The interview data was read several times by the researcher and then coded and analysed using a recognised qualitative software coding tool.
- The Delphi technique was used in this study to test the suggestions and recommendations made by the interview study participants, the findings of which ultimately informed the framework for a PBM toolkit.
- The statements presented in each round of the Delphi survey were rated independently by each participant based on their expert knowledge and experience.
- Consensus in the Delphi survey was based on group decisions rather than those of any single individual, making the outcomes more valid. The Delphi technique is based on the idea that several people are less likely to arrive at a wrong conclusion than a single individual is, meaning that group decisions are more valid than those made by a single individual.³³⁰

- All 11 participants who consented to participate in the Delphi survey took part in all three rounds of the survey. The 100% response rate added to the strength, rigour, credibility, and reliability of the consensus outcomes achieved.
- The Delphi survey participants did not know the identity of the other panel members, which allowed them to express themselves freely and respond to the survey in an unbiased and non-restricted manner. The anonymity of individual members in a Delphi study removes inherent bias, such as dominance and group conformity (defined as groupthink) observed with face-to-face group meetings.²⁹⁹
- The mixed-method approach was applied in this study to better understand the research problem by collecting and analysing data using more than one method. The research methods applied individually and collectively enabled the researcher to achieve all four of the study objectives and the overall aim of the study, which was to develop a validated framework for PBM toolkit to guide and support the implementation of PBM in SA and elsewhere.
- The findings reported in this study were shaped and informed by the study participants and not the researcher.
- A comprehensive trail of documents used in this study in a methodical approach is enclosed in the appendices.

4.8 ETHICAL CONSIDERATIONS

The study commenced after obtaining ethical approval from the UCT and the SANBS Human Research Ethics committees. Mouton explains that the researcher is obligated to explicitly communicate and discuss the aims and anticipated consequences of the research to individuals and groups that are likely to be affected by the study.²⁷⁷ Information detailing the purpose, aim, and objectives of the study was communicated to all participants using an information pamphlet (*Appendix A: Participant information pamphlet and informed consent document*). The researcher's contact details were included in the information leaflet.

Participation in the study was voluntary and no incentives were offered. Participants were free to withdraw from the study at any stage. Documented written informed consent was obtained from the PBM champion participants and the Delphi survey participants. Strict confidentiality of the data collected from the participants was maintained. The anonymity of the participants was also always maintained. The interview recordings that were forwarded to the transcriber for transcription did not contain the names of the participants. Names of participants were also not included in the reporting of the study findings.

The participants were allocated codes that were used during the analysis of the data and reporting of the study findings. The Delhi survey expert panel participants were not aware of who else made up the panel. The identity of the Delphi panel participants and the PBM champion participants was only known to the researcher and her study supervisors.

4.9 CONCLUSION

According to Thoele *et al.*, the development of a toolkit from start to finish is a multi-step process, and methods for toolkit development may include interviewing healthcare providers, conducting observations or site visits, and using a Delphi approach.²³⁴ In this study two of the three suggested methods (i.e. interviews and Delphi approach) were applied in developing the PBM toolkit framework. The mixed-methods approach applied in this study was comprehensive in collecting the data and analysis and provided depth, validation, and clarity of the research findings.

Overall, the design was appropriate for the study, and care was taken to ensure that the data collected would answer the research questions and achieve the study's aim and objectives. The results of the analysis of the data from the semi-structured interviews and the Delphi survey are presented in Chapters 5 and 6 respectively.

CHAPTER 5: RESULTS, DATA ANALYSIS AND FINDINGS OF THE SEMI-STRUCTURED INTERVIEWS

5.1 INTRODUCTION

The previous chapter provided a detailed description of the methodologies applied in collecting the data for the study. The literature review in Chapter 2 and Chapter 3 provided a global perspective on PBM implementation, the challenges and barriers experienced in various countries, the measures and modalities applied to support PBM implementation, and the outcomes achieved. The literature review, therefore, provided context, rationale, and direction for the research and informed the development of the interview guide for the one-on-one semi-structured interviews.

The purpose of the interviews was to gather a broad set of data to create a set of criteria to guide the development of a framework for a South African healthcare needs-focused PBM toolkit. The criteria were ultimately tested in a Delphi survey for their relevance, importance, and feasibility for the South African healthcare context. This chapter reports on the analysis of the results and the findings of the semi-structured interviews.

5.2 DATA ANALYSIS AND DESCRIPTION OF THE FINDINGS

The results of the one-on-one semi-structured interviews conducted with the PBM champion participants are reported according to the questions that comprised the PBM champion interview guide (*Appendix B_PBM Champion Interview Guide*). Detailed interviews were conducted with 16 PBM champions practising in various medical disciplines across six of the nine provinces in South Africa.

The results of the following interview questions presented to the participants are reported:

- Please describe your healthcare environment in terms of Patient Blood Management and its implementation. (***Your role, elements of PBM you focused on, successes achieved.***)

- What has been most helpful to you personally in your **development as a PBM champion**?
- Why do you believe **PBM implementation is important** in South Africa?
- Do you think a **PBM toolkit will be helpful** in your environment and why?
- What do you consider to be current **barriers and challenges to PBM implementation**, in your setting, and overall, in South Africa and other low- and middle-income countries?
(General challenges, practical challenges, hospital management-related challenges, policy challenges.)
- Is the **usage of blood and blood products monitored or audited** in your setting? Do you believe that monitoring and reporting of blood usage will reduce unnecessary transfusions?
If yes: Who should be monitoring?
- Please indicate your experience of the **availability and the extent of usage of the various modalities** used in PBM.
- If you had to develop a **PBM toolkit for South Africa**, what would you include as the **essential, cost-effective, feasible, best practice, evidence-based measures as clinical practice tools** with reference to the three pillars of PBM?
- What tools would you include to help create a **patient-centred transfusion practice culture**?
- What **format would you like the PBM toolkit** to be in (physical toolbox containing guidelines, diagrams, educational material, lectures on DVDs, standard operating procedures, etc., or a digital toolbox with all the mentioned elements, but everything online or both a physical and digital toolkit.)
- On which elements of PBM do you feel further **education and training** is required for doctors, nurses, and others, e.g. management?
- Do you have any practical **suggestions for the implementation of PBM in South Africa** that might help inform the framework for a PBM toolkit?

The results of the semi-structured interviews were captured and tabulated in Tables 1-9, *Appendix D, Interview Themes*. Due to the huge number of findings from the data gathered in the semi-structured interviews, only a small selection of the interview participants' own words is reported in the thesis.

5.2.1 Classification of the patient blood management champion participants

Table 5 below provides the demographic classification of the participants and the code allocated to each. The table also shows the type of healthcare environment the respective participants worked in and their specialties of practice.

Table 5: Classification of the patient blood management champion participants

Participant code	Designation	Type of healthcare environment	Province	Specialty of practice	Years of experience as healthcare professional	Years as PBM champion
P1	Consultant & Senior Lecturer	Academic & Private	Free State	Internal Medicine	>10	5
P2	PBM Consultant	Public and private	Involvement across all provinces except Western Cape	Transfusion Medicine	>10	6
P3	Nurse Specialist	Private	Western Cape	Gastroenterology	>10	3
P4	Consultant & Head of Department	Tertiary - Public	KwaZulu-Natal	Surgery	>10	3
P5	Consultant	Private and Public (Tertiary)	Gauteng	Obstetrics & Gynaecology	>10	5
P6	Consultant	Academic	Free State	Anaesthesiology	>10	5
P7	Consultant	Tertiary - Academic	Eastern Cape	Anaesthesiology	>10	4
P8	Consultant	Private	Gauteng	Clinical Haematology	>10	5
P9	Consultant	Private	Gauteng	Clinical Pathology	>10	3
P10	Consultant	Tertiary - Academic	Eastern Cape	Anaesthesiology	>10	5
P11	Consultant	Tertiary - Academic	Western Cape	Anaesthesiology	>10	5
P12	Nurse Management	Private	Gauteng	Multidisciplinary	>10	5
P13	Consultant	Tertiary - Academic	Free State	Anaesthesiology	>10	5
P14	Consultant	Private and Public (Tertiary)	KwaZulu-Natal	Clinical Haematology	>10	5
P15	Consultant	Tertiary - Academic	Western Cape	Anaesthesiology	>10	7
P16	Consultant	Tertiary - Academic	Western Cape	Anaesthesiology	>10	5

Table 5 above shows that the PBM champion participants were mainly senior-level healthcare professionals from both the public and private healthcare settings. The public sector participants worked largely in academic and tertiary-level healthcare facilities. The participants represented a variety of PBM-related medical disciplines. All participants had more than ten years of experience as health professionals and at least three years of involvement in PBM-related activities. The participants thus met the inclusion criteria for participation.

5.2.2 Description of the study participants

Table 1 (*Appendix D Interview Themes*) provides perspective on the participants' roles, their involvement in implementing PBM in their respective settings, the successes they achieved, and factors that influenced their development as PBM champions.

5.2.2.1 Role in patient blood management implementation

The participants took on various roles in implementing PBM in their respective settings. Their roles were largely advisory, providing educational support and guidance to encourage PBM-aligned clinical practices and reduce unnecessary blood transfusions. Several participants were active members of their HTCs or blood-users committees, which focused on monitoring and reporting blood and blood product ordering and usage in the respective hospitals. Four participants indicated involvement with PBM-related research. Other initiatives included developing and implementing PBM guidelines, managing and improving maternal health, managing anaemia and ID, treating preoperative anaemia, encouraging restrictive transfusion triggers, and reducing unnecessary transfusions.

5.2.2.2 Successes achieved

The participants achieved several successes in their respective healthcare settings. These included improving awareness of PBM among clinical colleagues, fostering better accountability and rational use of blood, improving access to IV iron, increasing IV iron usage, and improving

the management of preoperative anaemia. One participant said: *“What we are seeing is that our blood product usage is lower, and our expenditure hasn’t changed in the last four-five years despite prices going up.”*

5.2.2.3 Motivation for implementing patient blood management practices

Several factors encouraged and influenced the participants to implement PBM interventions in their hospitals. Understanding that PBM is a better way of doing medicine and seeing PBM as an opportunity to make a difference in patient care and overall healthcare were important factors. The growing body of literature on PBM, exposure to PBM information sessions and webinars, the association with like-minded individuals, especially ‘PBM giants’ and mentors provided motivation.

Having an influential leading PBM champion in SA available and willing to provide guidance, advice, and support was an enabling factor. The SSA PBM *WhatsApp* social media platform, which comprises health professionals actively contributing their PBM knowledge and experiences, was acknowledged as an encouraging, interactive information-sharing and education hub. This platform also served as an influential community of practice of like-minded individuals with a common keen interest in improving patient care.

Overall, the PBM champion participants’ years of experience as health professionals, their commitment, and active involvement with PBM including the successes they reported, validated their suitability to participate in this study. Overall, this added reliability and trustworthiness to the data collected and the findings reported.

5.2.3 The Importance of implementing patient blood management in South Africa and the value of a patient blood management toolkit

5.2.3.1 Results

Table 2a (*Appendix D*) provides the reasons why the participants felt that PBM implementation is important in SA. Table 2b (*Appendix D*) lists the participants' views of the value of a PBM toolkit as a supporting mechanism for PBM implementation in hospitals.

5.2.3.2 Data analysis and description of findings

Eighteen factors relating to why PBM implementation is important in SA were reported. The participants felt that PBM is a holistic, quality improvement healthcare approach that offers the opportunity to help address the anaemia disease burden in the country. The primary benefits of improving patient care and the additional gains of reducing healthcare costs and conserving donor blood by preventing unnecessary transfusions were the common themes. One participant provided clarity and context to PBM and explained as follows:

I feel patient blood management was maybe first ill-conceived as a way to reduce blood transfusions, whereas it's not. It's actually about patient management and optimising the patient, the management, and the outcomes of that patient, with reduction of morbidity and mortality.

Sixteen benefits associated with having a PBM toolkit were identified. The participants felt that having a PBM toolkit would speed up and support PBM implementation in hospitals by serving as an educational and clinical practice guide for doctors. One participant said, “*a toolkit makes philosophical ideas you know into practical concrete structure ... if I want to achieve this, follow one, two, three, concrete steps.*” A toolkit would therefore make PBM practically doable.

In summary, the implementation of PBM with guiding tools packaged in a toolkit would benefit patients and doctors and encourage accountable, evidence-based clinical practices with overall improvement of healthcare outcomes.

5.2.4 Barriers and challenges to patient blood management implementation

5.2.4.1 Results

Table 3 (*Appendix D*) provides a detailed list of the barriers and challenges to PBM implementation in SA. One hundred factors, arranged in four categories and nine subcategories, were identified as barriers and challenges that need to be addressed. Figure 9 below shows the categorization of the barriers and challenges to PBM implementation in SA.

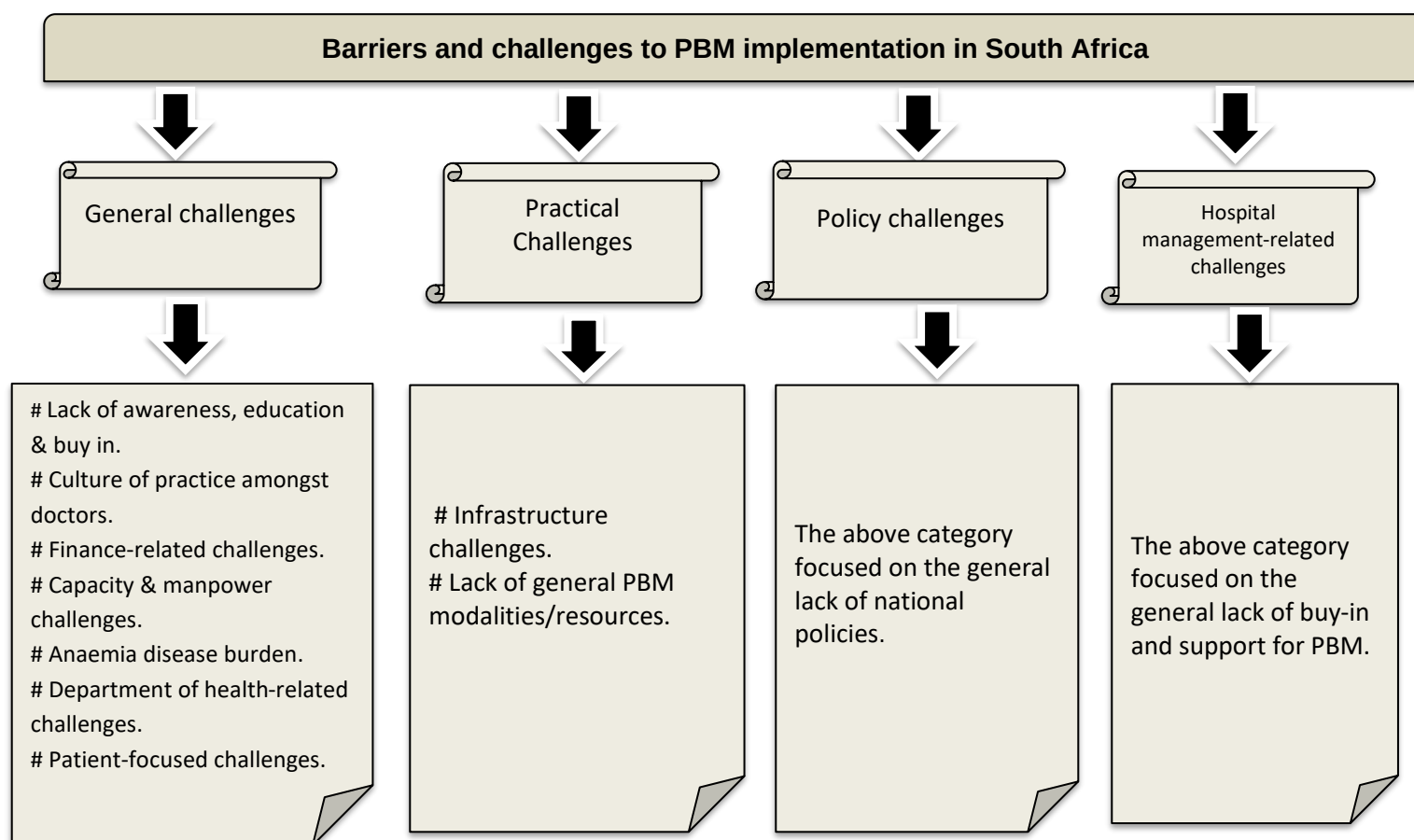


Figure 9: Categories and subcategories of themes identified as barriers and challenges to patient blood management implementation in South Africa.

5.2.4.2 Data analysis and description of findings

In the **general challenges** category, seven subcategories were identified. In the subcategory: ***Lack of PBM awareness, education, and buy-in***, 14 factors were identified. The lack of PBM knowledge and awareness among healthcare workers across all settings, from primary to tertiary healthcare levels, was emphasised as a significant barrier to PBM implementation. Also, the lack of PBM awareness among GPs and community health workers was also highlighted. The participants felt that the GP environment was ideal for the early detection and correction of anaemia and that community health workers had an important role to play in educating and advising communities on anaemia and general health. Some participants felt that nurses were important role-players in PBM, yet they were often excluded from PBM education and awareness initiatives.

Lack of PBM education during undergraduate and internship training of doctors and the overall lack of PBM guidance and advisory support for doctors in general were concerns. As one participant said,

... we need lectures for the undergraduates that focus on patient blood management and why it's important. We need people, HODs all coming on board and implementing SOPs, implementing guidelines, we need senior people doing that.

PBM not being formally endorsed by important stakeholders such as the DoH, South African Medical Association, and health insurers, coupled with the lack of support from senior leadership within hospitals made buy-in a challenge. Private hospitals not willing to buy into PBM was a further challenge.

In the subcategory ***Culture of practice amongst doctors***, 12 factors were identified. The long-standing historic practice of prescribing blood transfusions for the treatment of anaemia remains a norm among many doctors in both private and public hospitals. It was also mentioned that due to manpower and capacity challenges in the public sector hospitals, doctors have to manage a high number of patients on a daily basis. Such circumstances, coupled with easy access to blood, often make blood transfusions a quick and easy approach to correct low Hb levels in patients. It was also mentioned that transfusion triggers varied among clinicians within the same disciplines, and the use of single-unit transfusions was not a culture of practice in most settings. Again, private healthcare sector doctors not being accountable or answerable for their transfusion practices, lack of a multidisciplinary approach to patient care across public and private healthcare settings, resistance to change historic transfusion practices, and the ego of several doctors, made practice changes difficult.

In the subcategory ***Finance-related challenges***, seven factors were identified. Diagnostic limitations due to inadequate budgets for proper laboratory screening for the detection of anaemia and ID were reported. Gatekeeping measures also imposed restrictions on ordering of blood tests in the public healthcare sector. This resulted in anaemia going undetected in some patients, particularly in PHC facilities. Silo budgets, that is, separate laboratory budget, blood budget, pharmaceutical budget, and so on prevented best practices due to administrative controls. One participant said, *“we need to also start teaching administrators that if we can spend a little bit more on the lab budget, we’ll save a lot more on the blood budget.”*

Budget constraints were a significant concern, particularly the lack of funding for essential equipment and consumables. This included cell salvage technology and point-of-care testing devices such as rotational thromboelastometry (ROTEM) and thromboelastography (TEG). These viscoelastic methods provide rapid, real-time assessment of haemostasis and are very important

for effective bleeding management. Therefore, having such tools can reduce the need for blood transfusions and improve patient outcomes. There was also a lack of funds to employ more hospital staff, resulting in existing staff being overworked and having little motivation to focus on anything more than their routine functions. Due to a lack of awareness and understanding, PBM was perceived as overwhelming and potentially more work for doctors and nurses.

In the subcategory ***Capacity and manpower challenges***, eight factors were identified. Not having dedicated transfusion practitioners, PBM nurses and transfusion medicine specialists in the South African healthcare system was reported as a barrier. Not enough PBM champions to steer and drive a PBM culture was an added barrier. Lack of staff to run pre-operative anaemia clinics, review blood accountability forms, and audit and monitor blood usage in hospitals were further limitations. Additionally, the backlog of surgical cases coupled with lack of time and capacity in the public sector did not allow for pre-operative anaemia optimisation.

In the subcategory ***Anaemia disease burden***, 13 factors were identified. Participants felt that the high prevalence of anaemia in SA and frequency of anaemia in patients presenting at healthcare facilities led to anaemia “being an accepted norm”. It is therefore not prioritised or appropriately managed. It was mentioned that anaemia is often underdiagnosed, and it also goes undetected in some patients. Participants felt that PHC facilities and district hospitals were under resourced and inadequately geared for early detection and management of anaemia. This placed a strain on tertiary facilities when patients eventually develop complications.

It was again mentioned that pre-operative anaemia optimisation was not a routine practice in both public and private hospitals. It was emphasised that oral iron, and not blood transfusions, should be the first modality in correcting ID in patients. Another concern was that oral iron is not always well tolerated by many patients; additionally, patients are not educated on how to take oral iron and how to deal with side effects.

Oversampling of patients, big sample draws, and unnecessary repeat testing was common in hospitalized patients and was a contributing factor to anaemia.

In the subcategory ***Department of Health-related challenges***, five factors were identified. Participants felt that the silo culture of health departments in the various provinces created regional disparities in healthcare delivery. Poverty in society and the lack of sustained attention from the DoH on the consequences of undetected and poorly managed anaemia in the South African population were concerns. The lack of endorsed national policies to guide clinical practices was a major barrier.

In the subcategory ***Patient-focused challenges***, six factors were identified. The participants felt that the general lack of a patient-centred healthcare culture in SA and elsewhere was an important barrier that resulted in patients not being educated and empowered. Patients not being referred early enough and the lack of proper informed consent for blood transfusions put patients at risk. Participants felt that blood-ordering forms should include reasons why blood is being ordered for individual patients, and whether treatment options other than transfusion have been considered.

In the **Practical challenges** category, two subcategories were identified. In the first subcategory, ***Infrastructure challenges***, six factors were identified. The lack of space and infrastructure to set up anaemia clinics was mentioned. Non-existent or dysfunctional computer systems in public hospitals made access to laboratory results a challenge. Lack of electronic hospital monitoring systems for blood usage (ideally linked to the blood bank) created dependence on the blood services for hospital blood usage data. Participants also mentioned that the lack of ambulances caused delays in transferring patients with anaemia associated complications, bleeding and blood loss, to secondary and tertiary level healthcare facilities. Patients thus end up being further complicated which can lead to detrimental or fatal outcomes.

In the second subcategory, ***Lack of general PBM resources/modalities in hospitals***, 10 factors were identified. Participants indicated that haematinics were not always available in PHC facilities. Oral iron stocks ran out in some facilities and tranexamic acid was not available in some hospitals. The lack of validated point-of-care testing devices, the lack of cell salvage equipment and consumables were all barriers to PBM implementation. Access to IV iron and the tedious motivation process in the private healthcare sector was a significant challenge. One participant stated: *“As doctors we can have all the knowledge in the world and all the skills, but that might not be relevant in your work environment if you don’t have the resources.”*

In the category of **Policy-related challenges**, 13 factors were identified. Challenges mentioned by the participants included the lack of national policies to guide practice, lack of a standardised blood transfusion protocols in hospitals, poor or slow implementation of policies with no monitoring of policy implementation. The lack of guidance on anaemia management in primary, secondary, and tertiary healthcare facilities and the lack of multidisciplinary collaboration around policy development were added challenges. Getting timeous endorsement of policies by the DoH was a barrier to policy implementation.

In the category of **Hospital-management related challenges**, five factors were identified. The lack of buy-in and support for PBM from hospital management was a major barrier. The absence of, or inadequately functioning blood-user committees/HTCs, including the lack of accountability measures for irrational blood usage, were other mentioned challenges. Participants highlighted that not all hospitals used blood-accountability forms when ordering blood and blood products.

In summary, multiple barriers and challenges to PBM implementation were reported. Devoting attention to these and directing efforts to address at least some of the barriers and challenges would enable the implementation of PBM practices in South African hospitals.

5.2.5. Auditing and monitoring of blood and blood products

5.2.5.1 Results

Table 4 (*Appendix D*) provides the participants' perspectives on monitoring and auditing blood and blood product usage in hospitals. Responses are provided to the following three questions: (a) Should blood and blood product usage be monitored and audited? (b) What are the associated benefits? and (c) Who should do the monitoring?

5.2.5.2 Data analysis and description of findings

All participants agreed that blood and blood product usage should be monitored and audited in all hospitals. One participant said, "*you cannot implement PBM without auditing blood utilisation.*" Participants felt that routine audits would help identify blood utilisation trends within departments and the hospitals overall. This would create opportunities to educate doctors and correct poor blood-ordering practices, rather than imposing punishment. Also, auditing of blood usage would create improved awareness and translation of PBM in daily practices. The majority of participants agreed that the HTCs or blood users' committees should monitor and report on blood usage in hospitals.

In summary, monitoring and auditing blood and blood products was seen as an active PBM surveillance tool and a key measure in evaluating PBM implementation.

5.2.6 Availability and usage of patient blood management modalities

5.2.6.1 Results

Table 5 (*Appendix D*) gives an account of the availability and usage of the various PBM modalities in the healthcare facilities where the participants worked.

5.2.6.2 Data analysis and description of findings

Oral iron and tranexamic acid were available and frequently used modalities across both public and private healthcare facilities. Access to IV iron in the private healthcare sector was a major challenge, with health insurers requiring motivation from treating clinicians for its use as an anaemia treatment modality. Motivations were not always accepted by the insurers and even when authorisation was granted, it caused delays in treatment. Although IV iron was more accessible in public hospitals, it was not a frequently used modality.

Erythropoietin was not commonly used across both the private and public healthcare facilities. Participants stated that erythropoietin was mainly used in renal units, largely in tertiary hospitals. Point-of-care (POC) Hb testing was more often used in public healthcare facilities. TEG and ROTEM were commonly used in private hospitals and some tertiary-level public healthcare facilities. Cell salvage was also mainly used in some private hospitals and tertiary-level public healthcare facilities. Optimising anaemia before surgery and the use of single-unit transfusions were not common in both public and private healthcare facilities. Blood accountability forms were used in some public hospitals. There was no reported use of such accountability measures in private healthcare.

In summary, oral iron and tranexamic acid were the most common and frequently used PBM modalities. The use of the other listed modalities varied within the different healthcare settings, with certain effective PBM modalities such as IV iron being rarely or never used.

5.2.7 Tools suggested for a patient blood management toolkit for South Africa

5.2.7.1 Results

Table 6 (*Appendix D*) lists the suggested tools for a PBM toolkit appropriate for the South African healthcare context. One hundred and twenty-eight PBM tools, arranged in eight categories and three subcategories were identified.

Figure 10 below shows the categories and subcategories of the suggested tools.

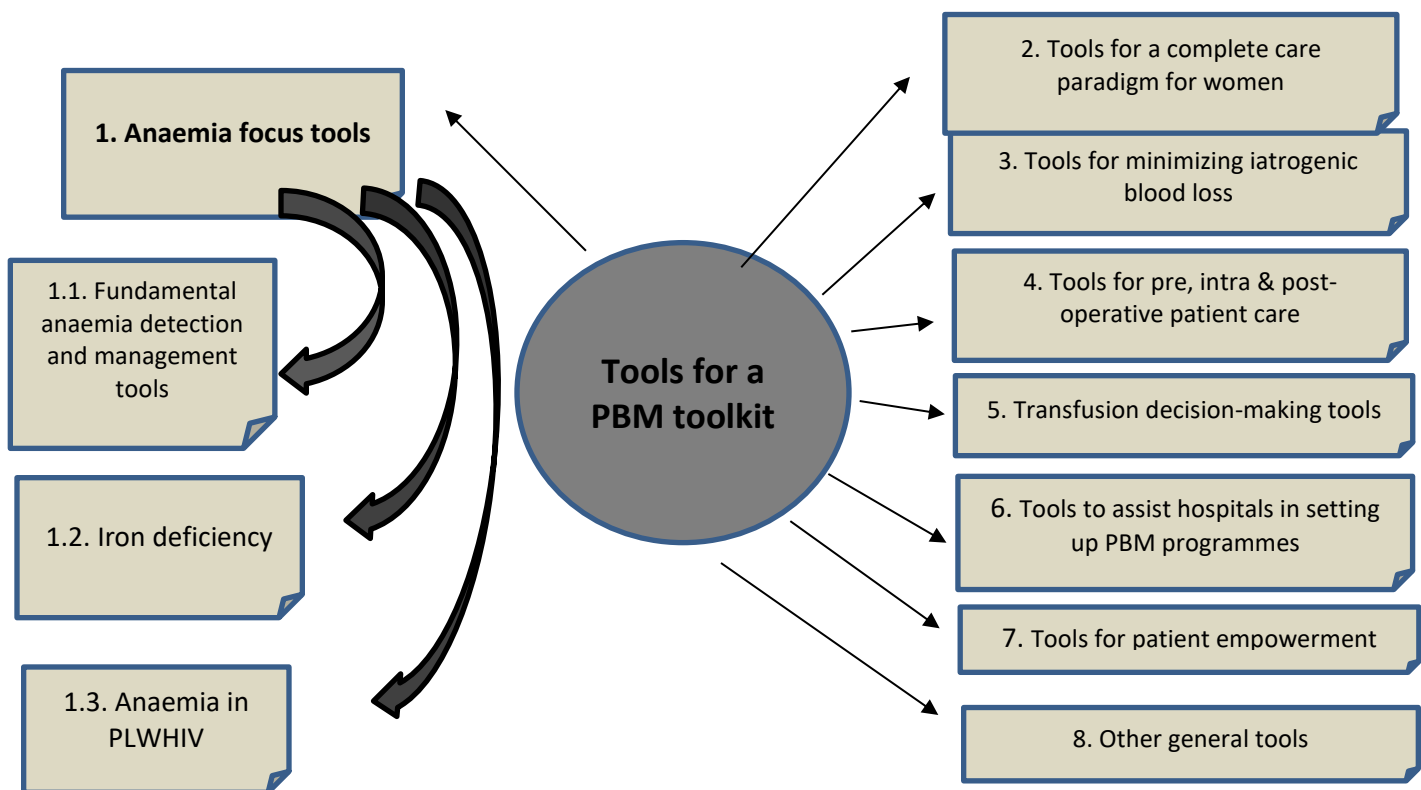


Figure 10: Categories and subcategories of tools suggested for a PBM Toolkit

In the first category, **Anaemia focus tools**, three subcategories were identified. In the first subcategory, **Fundamental anaemia detection and management tools**, nine elements were identified. The participants recommended the need for anaemia detection and management algorithms and flowcharts to guide the selection of laboratory tests, including when to order what tests.

The toolkit should also include approaches to identifying and treating the underlying causes of anaemia, with guidance on when to refer patients for further evaluation. Case scenarios to guide clinical decision-making were suggested as additional support tools. A list of drugs that cause anaemia was deemed important. Early patient referral guidelines were advocated.

In the second subcategory, ***Iron-deficiency***, seven aspects were identified. Participants advocated the need to perform routine serum ferritin tests on patients and the importance of iron studies was emphasised. Some recommended that fasting samples should be used for reliable iron studies results. Guidance for prescribing and administering oral iron (how and when it should be taken) and IV iron, including follow-up of patients, were considered necessary.

In the third subcategory, ***Tools for management of anaemia in patients living with HIV (PLWHIV)***, 14 elements were identified through the review of the literature. The interview guide did not include questions on the management of anaemia in PLWHIV. Based on the high prevalence of HIV globally, and in SA, and the fact that anaemia is the most frequent haematologic abnormality seen among people with HIV,¹⁹³ it was deemed important to include tools for the management of anaemia in PLWHIV. A set of tools was thus extracted from the literature and later tested in the Delphi survey for their relevance. These included having a simplified diagnostic approach to the diagnosis and management of anaemia in PLWHIV, associated risk factors, major causes of HIV-related anaemia, drug implications, malignancies, and clear treatment guidelines including the impact of various highly active antiretroviral therapy (HAART), the preferred term now being combined antiretroviral therapy (cART)).

In the second category, ***Tools for a complete care paradigm for women***, seven aspects were identified, and these were directed at dealing with anaemia caused by HMB, improving obstetric care and follow-up of patients.

In the third category, **Tools for minimising iatrogenic blood loss**, six aspects were listed, which focused on the use of POC testing, taking smaller volume samples for laboratory testing (microsampling or microbleeding), and avoiding unnecessary repeat testing.

In the fourth category, **Tools for preoperative, intraoperative and postoperative patient care**, 35 patient management considerations were identified. The tools suggested by the participants largely resembled elements listed in the three-pillar, nine-field PBM matrix presented to the participants in the interview guide and during the interview process (*Appendix B_ PBM Champion Interview guide*).

In the fifth category, **Transfusion decision-making tools**, eight aspects were listed which focused on products and services offered by the blood services, including their associated costs, transfusion risks and hazards, restrictive transfusion thresholds, and adopting the practice of using single-unit transfusions.

In the sixth category, **Tools to assist hospitals in setting up PBM programmes**, 22 tools were suggested including guidelines for setting up PBM programmes appropriate for the various healthcare settings, PBM readiness checklists, templates for patient history-taking, informed consent documents, laboratory and testing awareness tools, guidelines for setting up HTCs and structuring the appropriate agenda, a code of conduct for ordering and administering blood transfusions and audit tools as evaluation or implementation outcomes measures.

In the seventh category, **Tools for creating a patient-centred culture**, 14 factors were suggested to help create a patient-centred care paradigm in healthcare. Improving knowledge and awareness among patients was considered key to empowering patients and communities at large. Suggested approaches for patient education and empowerment included: patient-focused talks and information campaigns by healthcare workers/organisations, awareness feeds via social

media platforms, radio, information booklets tailored to language needs, online platforms such as YouTube videos, digital education apps specific for patients, as well as posters and other media. For accessibility, these could also be made available in waiting rooms in hospitals and clinics. Doctors making time to talk to and advise patients, and health insurers serving as a voice to educate patients were seen as avenues to create better health awareness among patients.

In the last category of **Other general PBM tools**, six aspects were identified. The need for blood-ordering forms to include questions on whether alternate approaches other than blood transfusion have been considered for patients was suggested. Other suggested tools included having a common blood usage-monitoring dashboard for hospitals and having an app for doctors to serve as a platform for PBM-related questions, answers and alerts. A digital tool or app for the motivation of IV iron to health insurers was well supported.

In summary, a comprehensive mix of tools targeting the pillars of PBM – that is, comprehensive anaemia management, managing bleeding and blood loss, harnessing, and optimising physiological tolerance of anaemia and the appropriate use of blood and blood products – were advocated and listed. Additionally, tools for creating a patient-centred culture were deemed necessary as this is the foundation upon which PBM rests. The broad set of tools, grouped and categorised, formed the preliminary structure of the framework for a PBM toolkit which was later tested by an expert panel in the Delphi survey.

5.2.8. Patient blood management toolkit format (look and feel)

5.2.8.1 Results

Table 7 (*Appendix D*) gives an account of the participants' views on how the toolkit should be made available for best utility.

5.2.8.2 Data analysis and description of findings

The participants felt the toolkit should be an all-inclusive package that includes videos, diagrams, lectures/podcasts, protocols, policies, procedures, templates, and checklists. Most of the participants felt that the toolkit should be available in both an electronic or digital format in a physical format for wider accessibility. Some participants recommended the need for a toolkit specific to nurses due to their important role in PBM. As one participant said:

I think nursing it's a really good place to get patient blood management going because if we have a toolkit and it can instil in the nurses the aspects of patient blood management, there's nothing more convincing than a sister that doesn't want to do something for the right reasons.

In summary, a PBM toolkit available in both an electronic and physical format would have a wider reach and thus cater for those with and without suitable electronic devices/computers and the necessary infrastructure.

5.2.9 Patient blood management educational needs for doctors, nurses, hospital management and patients

5.2.9.1 Results

Table 8 (*Appendix D*) lists the PBM educational needs suggested for doctors, nurses, hospital management and patients.

5.2.9.2 Data analysis and description of findings

Sixty aspects grouped into nine subcategories were identified as the main knowledge and education aspects needed to empower doctors and nurses to correctly understand and apply PBM principles in routine practice. Figure 11 below shows the subcategories of themes identified as educational needs for doctors and nurses.

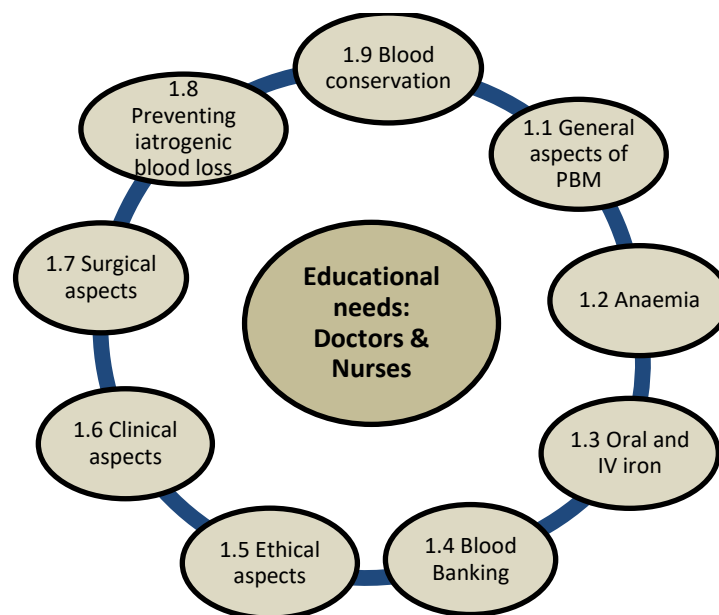


Figure 11: Subcategories of themes identified as educational needs for doctors and nurses.

In the first subcategory, **General aspects of PBM**, participants felt a need for education on haemostasis, the definition and benefits of PBM, the multidisciplinary patient care paradigm, and how to practically apply the three PBM pillars. Understanding the role of nurses and the laboratory was considered necessary. The management and optimal use of resources in resource-constrained healthcare settings was identified as an important learning area.

In the second subcategory dealing with **Anaemia**, participants highlighted the need for education on the causes of, and the approaches to early detection and treatment of anaemia. The importance of understanding the consequences of untreated anaemia, including the impact of ID in women, understanding laboratory test results, and when to order which tests was highlighted. In the third subcategory, focusing on **Oral and IV iron**, knowledge of iron metabolism, and when and how to administer oral iron and IV iron in what clinical circumstances was considered important. Follow-up of patients on oral iron and education to help demystify myths associated with IV iron use, including how to manage and prevent IV iron-related adverse events, was considered necessary.

In the fourth subcategory on **Blood banking**, knowledge and understanding the indications for blood and blood product, clinically appropriate use of each, product and testing costs and correct storage of the various products and avoiding and managing transfusion adverse events were considered important. It was highlighted that doctors needed to learn that blood transfusion should not be the first-choice treatment for the correction of anaemia.

In the fifth subcategory on **Ethical aspects**, participants felt that education on the ethical imperative of PBM, the medico-legal implications of inappropriate blood use and the inappropriate anaemia management was needed. The process for proper informed consent and the importance of making time to advise, educate and empower patients were also important learning needs.

In the sixth subcategory on **Clinical aspects**, several key educational needs were highlighted, and these included: clinically appropriate transfusion decision-making, focusing on moving away from knee-jerk reactions to informed decision-making, adequate assessment of patients, restrictive transfusion thresholds, transfusion risks and benefits, use of single-unit transfusions, and the importance of early patient referrals.

With regard to the **Surgical aspects** in subcategory seven, education was needed on preoperative, intraoperative, and postoperative patient care, benefits of pre-operative anaemia optimisation, timing of surgery and the use of tranexamic acid and other fibrinolytics.

In the eighth subcategory on **Preventing iatrogenic blood loss**, education on the importance of avoiding unnecessary repeat laboratory testing, taking smaller volume samples and the benefits of POC testing were mentioned.

In the ninth subcategory on **Blood conservation**, educational needs on alternate approaches to anaemia management other than blood transfusion, use of cell salvage and autologous transfusion options were suggested.

In the category ***Educational needs for hospital management***, participants stated the need for knowledge and awareness on the role of management/leadership in PBM implementation and sustainability. Emphasis on PBM-associated patient benefits, hospital cost-savings and overall healthcare benefits were important awareness needs. It was suggested that hospital management personnel be educated on the cost of blood and blood products versus alternative approaches to the treatment of anaemia. Awareness of the importance of having haematinics and pharmacological and haemostatic agents available in hospitals and clinics was important.

In the last category, ***Educational needs for patient empowerment***, participants felt that patients needed awareness of anaemia, the common symptoms and the associated consequences, especially with regard to ID in women and children. Education on how to take oral iron and reporting any discomfort to the treating doctor were considered important. The participants also felt that patients needed to be aware of the risks of blood transfusions, the process for proper informed consent, and alternate treatment options other than blood transfusions. General health awareness, self-care and patients taking ownership of their health were considered important. One participant said that *“an informed patient is a much better patient than an uninformed one because your care just becomes easier because they can play an active role in getting well.”*

In summary, the lack of PBM knowledge and awareness among clinicians and other PBM stakeholders was a significant barrier to PBM implementation. A wide range of educational needs was identified for the various PBM role players, including patients. Ongoing education of all role-players was deemed key to the implementation and sustainability of PBM.

5.2.10 Suggestions for implementation of patient blood management in South Africa

5.2.10.1 Results

Table 9 (*Appendix D*) lists the participants' suggestions for the implementation of PBM in SA.

5.2.10.2 Data analysis and description of findings

Forty-two factors were identified in this section of the interview dealing with practical suggestions for the implementation of PBM in SA and even elsewhere. Collaboration and buy-in for PBM from important stakeholders, such as the DoH, hospital management, hospital departments, doctors, nurses, blood services, health insurers, etc. were highlighted as necessary to lead and establish a culture for PBM implementation. One participant said: *"it needs education, buy-in and passion from all the people across the patient journey."* Endorsement of PBM by the DoH, the South African Medical Association, and health insurers would add gravitas to the need for implementation. Endorsed national policies and guidelines, accompanied by PBM education and awareness of health professionals, patients and administrators were necessary.

Funding and budget availability, including infrastructure support for PBM, adopting a multidisciplinary healthcare approach, establishing anaemia and iron infusion clinics aimed at targeting early detection and correction of anaemia not only in surgical patients but all patients were key factors. Monitoring and auditing blood and blood product usage in hospitals was considered critical. Recognising and acknowledging the roles of PBM champions, nurses, and the laboratory in PBM implementation was necessary. Some participants felt that focusing on implementing PBM Pillar One (early detection and correction of anaemia) would be a good enough starting point and through this PBM Pillar Two and Pillar Three will ultimately follow. One participant stated:

... half the battle would be won if we could implement Pillar One. Honestly, I think there's nothing in pillar one that is expensive, I don't think there's anything in pillar one that's even difficult. We just need to grasp pillar one and make it fit for our local purposes.

In summary, the participants felt that the implementation of PBM in South Africa required buy-in and support from all stakeholders and governance structures directly and indirectly involved in quality care outcomes for patients. Having national policies and guidelines, more champions to drive the adoption of PBM practices, bridging the education and awareness gaps, and having the infrastructure, resources, and basic PBM modalities, including dedicated funds or budget for PBM-aligned practices, were key aspects to consider.

5.3 CONCLUSION

This chapter dealt with the results, data analysis, and description of findings from the one-on-one semi-structured interviews with the PBM champion participants. A broad set of data was identified and categorised into themes, and this, in conjunction with the literature review, formed a valuable base of data which was used to develop the criteria or statements that were subsequently tested in the Delphi survey. The next chapter will provide a description of the Delphi survey process, analysis of the results, and key findings of the survey.

CHAPTER 6: RESULTS, DATA ANALYSIS, AND FINDINGS OF THE DELPHI SURVEY

6.1 INTRODUCTION

The previous chapter provided an analysis of the results and a description of the findings of the one-on-one semi-structured interviews with the PBM champion participants. The findings of the interviews informed the development of the Delphi survey. This chapter presents the results and key findings of the Delphi survey. The Delphi technique, described in detail in Chapter 3, is a series of sequential questionnaires or 'rounds', interspersed by controlled feedback that seeks to gain the most reliable consensus of opinion of a group of experts.^{331,332}

6.2 DESCRIPTION AND DISCUSSION OF THE DELPHI SURVEY

The results and findings of the Delphi survey are provided for each of the three rounds, with a summative discussion of the overall outcome of the Delphi survey at the end of the chapter.

6.2.1 Delphi survey – Round One

This section provides an overview of the Delphi survey process and includes explanatory notes about the different sections, subsections, titles, number of statements in each section of the Delphi questionnaire, and the measuring scales used. This section also provides a summary of the results and analysis of the Delphi panel participants' responses.

6.2.1.1 The measuring instrument

In the first round of the Delphi survey process, a letter (*Appendix E1*) and the electronic SurveyMonkey® link to the Delphi questionnaire (*Appendix E2*) were individually forwarded via email to the respective Delphi survey participants. The letter provided an explanation of the Delphi procedure, the structure of the questionnaire, and instructions on how to access and complete the questionnaire.

The participants were informed that each statement in the questionnaire had to be evaluated in terms of its importance on a three-point Likert scale. These points were defined as follows:

1 = Essential (This criterion must **DEFINITELY BE INCLUDED** in the framework for a PBM toolkit)

2 = Useful (This criterion **CAN BE INCLUDED** in the framework for a PBM toolkit)

3 = Unnecessary (This criterion must **BE EXCLUDED** from the framework for a PBM toolkit)

The structure of the five sections that comprised the questionnaire is discussed below. The fundamental structure of the survey remained the same in all three rounds and will therefore be discussed only once, in this chapter.

Section A of the Delphi questionnaire: **THE IMPORTANCE OF PBM IMPLEMENTATION IN SOUTH AFRICA AND THE NEED FOR A PBM TOOLKIT** (*Appendix E2*) dealt with the reasons why PBM implementation is important in SA and why a PBM toolkit is needed. This section comprised two subsections with each sub-section containing a series of statements (n= 33). A comment line was allocated after each statement for comments or points of clarity deemed necessary by the participants.

Section B of the Delphi questionnaire: **AUDIT AND MONITORING OF BLOOD USAGE IN HOSPITALS** (*Appendix E2*), dealt with the need for auditing and monitoring of the usage of blood and blood products in hospitals; and who should be responsible for this function. This section comprised eight statements (n=8). A comment line was allocated after each statement for comments or points of clarity deemed necessary by the participants.

Section C of the Delphi questionnaire: **GUIDANCE RESOURCES NEEDED AS TOOLS FOR A PBM TOOLKIT APPROPRIATE FOR PRIMARY, SECONDARY, AND TERTIARY LEVEL HEALTHCARE FACILITIES IN SOUTH AFRICA** (*Appendix E2*), dealt with selecting the essential, cost-effective, feasible, best practice, evidence-based measures or resources as

clinical practice tools for a PBM toolkit appropriate for primary, secondary, and tertiary level healthcare facilities in SA. It also focused on the look and feel of the toolkit in terms of how the toolkit should be made available for the best utility. This section was divided into three subsections containing 154 statements, of which 147 statements were triplicated to allow the participants to rate the importance of each in **primary, secondary, and tertiary-level healthcare facilities** respectively. The total number of statements in Section C was therefore 448 (n = 448). A comment line was allocated after each set of statements for comments or points of clarity deemed necessary by the participants.

Section D of the Delphi questionnaire: **PBM EDUCATION DEFICIENCIES AND EDUCATION FAILURES** (*Appendix E2*), dealt with the PBM knowledge deficiencies, including the existing education failures that need to be addressed among the various stakeholder groups. This section was divided into three subsections containing 123 statements, of which 66 statements were duplicated to allow the participants to rate their importance in terms of educational needs for **doctors and nurses** respectively. The total number of statements in Section D was therefore 189 (n = 189). A comment line was allocated after each set of statements for comments or points of clarity deemed necessary by the participants.

Section E of the Delphi questionnaire: **CHALLENGES AND BARRIERS TO PBM IMPLEMENTATION IN SOUTH AFRICA** (*Appendix E2*), dealt with existing challenges and barriers that need to be addressed to help enable PBM implementation in hospitals across South Africa. This section comprised 115 statements (n = 115), and a comment line was allocated after each statement for comments or points of clarity deemed necessary by the participants.

Overall, round one of the Delphi questionnaire comprised 793 statements.

6.2.1.2 Analysis of Delphi Survey Round One Responses

The responses from the Delphi participants were extracted from SurveyMonkey®; which provided an electronically generated dataset showing the number and percentage of participants that selected 1: Essential, 2: Useful, and 3: Unnecessary on the Likert scale for each statement. Consensus was considered to be achieved when 80% of the 11 panel members selected the same option on the Likert scale. In instances where any participant/s opted not to respond to a particular statement, the percentage consensus was based on the total number of participants that responded to the statement. All the statements for which consensus was reached in Round One were excluded from round two of the survey.

6.2.1.3 Findings of Round One of the Delphi Survey

All 11 members of the Delphi panel completed the Round One questionnaire of the Delphi survey (100% response rate). In Round One consensus was reached on 390 of the 793 statements in the questionnaire, giving a 49.2% overall consensus. One statement (presented in triplicate for primary, secondary, and tertiary healthcare facilities) was removed from the Round Two questionnaire, as there was no substantial evidence in the literature to support the statement. This statement *“Fasting samples must be taken for reliable iron study results”* is presented in italics in Table 5 below.

Following analysis of the Round One questionnaire, a feedback letter together with the findings of the first round of the Delphi was individually forwarded to the Delphi panel participants (*Appendix E3*). The feedback included a copy of the Delphi questionnaire, showing the statements for which consensus had been reached, participants’ comments and questions, and comments from the researcher in response to certain comments made by the participants. The researcher further thanked the participants for participating in the survey and provided details of when to expect Round Two of the survey.

6.2.2 Round Two of the Delphi Survey

As in the previous round, the measuring instrument used in Round Two of the Delphi survey will be discussed. Additionally, the method of data analysis and findings are provided.

6.2.2.1 The measuring instrument

Four weeks after sending out Round One of the Delphi survey, a letter (*Appendix F1*) providing the details of Round Two of the survey together with the electronic SurveyMonkey® link to the Round Two Delphi questionnaire (*Appendix F2*) was forwarded via individual emails to the respective Delphi survey participants. The letter explained the purpose of the Round Two procedure and instructions on how to access and complete the questionnaire. The Round Two questionnaire comprised 400 statements. In this round, the questionnaire additionally included the participants' collective responses to statements carried over from the Round One to the Round Two questionnaire, that is, the percentage of participants that selected 1: Essential, 2: Useful, and 3: Unnecessary on the Likert scale for statements carried over.

The participants were informed that this was by no means intended to coerce them into making a particular selection. According to Keeney *et al.*, it is only through seeing the (anonymous) responses from other panel members that participants are encouraged to reconsider their views.³²⁰ Participants could change their opinion if they wished to do so and could thus assign a different level of importance to any of the statements where they considered this appropriate.

6.2.2.2 Analysis of Delphi survey Round Two Responses

As done in Round One, the participant responses to the Delphi Round Two survey were extracted from SurveyMonkey®, which provided an electronically generated dataset showing the number and percentage of participants that selected 1: Essential, 2: Useful, and 3: Unnecessary on the Likert scale for each statement.

Consensus was achieved when 80% of the 11 panel members selected the same option on the Likert scale. Statements where consensus was reached in Round Two were excluded from Round Three of the survey. The statements on which consensus had still not been reached were carried over to Round Three.

6.2.2.3 Findings of Round Two of the Delphi Survey

All 11 members of the Delphi panel completed the Round Two questionnaire of the Delphi survey (100% response rate). After Round Two, consensus was reached on 573 of the overall 790 statements, giving a 72.5% consensus. One statement (presented in triplicate for primary, secondary, and tertiary healthcare facilities) was removed from the Round Three questionnaire due to the uncertainty of the availability of the pharmaceutical modality included in the statement. The statement “*Advice on the use of aprotinin*” is presented in italics in Table 5 below.

6.2.3 Round Three of the Delphi survey

Round Three of the Delphi survey was facilitated in the same manner as the previous two rounds. In addition, a feedback letter together with the findings of the Delphi survey Round Two was included in the email to the Delphi panel participants (*Appendix F3*). The feedback included a copy of the Delphi Round Two questionnaire, showing the statements for which consensus had been reached. Additionally, the feedback included comments and questions from the participants as well as the researcher’s response to certain comments made by the participants.

After completion of Round Three, a feedback letter with the results of Round Three was individually forwarded to all participants (*Appendix G3*). The researcher further thanked the participants for their time and effort towards completing all three rounds of the survey.

This section provides a discussion of the measuring instrument and the analysis of the participants’ responses in Round Three. This section further presents the consolidated findings of the overall Delphi process (all three rounds).

6.2.3.1 The measuring instrument

Three weeks after sending out Round Two of the Delphi survey, a letter (*Appendix G1*) providing the details of Round Three (final round) of the survey, together with the electronic SurveyMonkey® link to the Round Three questionnaire (*Appendix G2*), was forwarded via email to the respective Delphi survey participants. The letter explained the purpose of the Round Three procedure and instructions on how to access the survey link and complete the questionnaire.

The Round Three questionnaire comprised 214 statements. As done in Round Two, the final round of the questionnaire included the collective percentages of the participant's responses to the statements carried over from Round Two to the Round Three questionnaire. The participants were again informed that this was by no means intended to coerce them into making a particular selection. This merely allowed the participants to re-evaluate their individual responses in the context of the group's responses, allowing them the freedom to change their selection or maintain their previous position. They could thus assign a different level of importance to any of the statements they considered appropriate.

The purpose of Round Three was to try and reach consensus on statements where this was still lacking, failing which, to declare stability. Stability is described as the natural tendency for opinions of experts to centralise after a series of rounds.³³¹ In simple terms, it refers to fewer numbers of participants changing their responses or opinions on the statements presented.

6.2.3.2 Analysis of responses

As done in the previous two rounds, the responses from the Delphi participants were extracted from SurveyMonkey®, which provided an electronically generated dataset showing the number and percentage of participants that selected 1: Essential, 2: Useful, and 3: Unnecessary on the Likert scale for each statement.

Consensus was achieved when 80% of the 11 panel members selected the same option on the Likert scale. Stability was declared when 20% (two or fewer) of panel members having changed their opinion on a particular statement.

6.2.3.3 Findings of Round Three of the Delphi Survey

All 11 of the Delphi panel participants completed the Round Three questionnaire of the Delphi survey (100% response rate). After Round Three, consensus was reached on 694 of the final 787 statements in the questionnaire, giving an 88.1% overall consensus. Consensus was not achieved on 93 of the 787 statements. Stability was reached on 85 of the 93 statements on which consensus was not achieved, with overall stability on 85 of 787 statements (10.8%). The number of statements on which either consensus or stability had been reached was therefore 779 out of 787 (98.9%).

6.3 SUMMATIVE DISCUSSION ON THE OUTCOME OF THE DELPHI SURVEY

After Round One, consensus was reached on 49.1% of the 793 statements, while after Round Two, consensus increased to 72.5% of the 790 statements (one statement, presented in triplicate for primary, secondary, and tertiary healthcare facilities, was removed). After Round Three, consensus was reached on 88.1% of the final 787 statements (another statement presented in triplicate for primary, secondary, and tertiary healthcare facilities was removed). Stability was declared on 10.8% of the statements.

The total number of statements where either consensus or stability was reached was therefore 779 out of 787 (98.9%). There were eight statements (1%) for which neither consensus nor stability was achieved.

The factors or elements contained in the statements deemed **ESSENTIAL** through consensus as previously defined are aspects that must be included in the framework for a PBM toolkit. Factors deemed **USEFUL** through consensus may also be included to enhance the patient care approach,

but are not necessarily essential. Factors deemed **UNNECESSARY** through consensus should be excluded from the framework for a PBM toolkit.

Table 6 below provides the consolidated results of all three rounds of the Delphi survey. It provides a detailed analysis of all the statements presented to the participants in the Delphi survey, showing the statements on which **CONSENSUS** was achieved. It also shows in which of the three rounds of the Delphi survey consensus was achieved, and the collective percentages of the participants' responses to the respective statements.

In Table 6 below "R" refers to the Round of the Delphi survey. The numbers in the brackets indicate the percentage of participants that selected 'ESSENTIAL,' 'USEFUL,' or 'UNNECESSARY' on the Likert scale for each statement.

Example: Consensus R1 (80:10:10), means that for that particular statement, consensus was achieved in Round 1 of the survey and 80% of the participants selected ESSENTIAL, 10% selected USEFUL, and 10% selected UNNECESSARY.

The table additionally shows the statements for which **STABILITY** was declared after Round Three, as well as the statements for which neither consensus nor stability was declared. The statements showing stability are presented in *italics* and shaded grey.

Table 6: Final consolidated results of the three rounds of the Delphi survey

	SECTION A: The importance of PBM implementation in South Africa and the need for a PBM toolkit. This section deals with the reasons why PBM implementation is important in South Africa and why a PBM toolkit is needed.			
1	How would you rate the following reasons for why PBM implementation is important in South Africa?	Essential	Useful	Unnecessary
	It is a holistic healthcare approach.	Consensus R1 (90:10:0)		
	It can improve the healthcare of the nation.	Consensus R1 (80:20:0)		
	It is based on patient-focused outcomes.	Consensus R1 (90:10:0)		
	It protects patients' rights and safety.	Consensus R1 (90:10:0)		
	It supports a preventative healthcare paradigm.	Consensus R2 (100:0:0)		
	It will improve women and children's health.	Consensus R1 (90:10:0)		
	It is a quality improvement healthcare approach.	Consensus R1 (90:10:0)		
	It is a practical approach to address the high prevalence of anaemia.	Consensus R1 (90:10:0)		
	It offers opportunity for early detection & correction of anaemia.	Consensus R1 (80:20:0)		
	PBM is not only about surgery; it has a wide healthcare reach.	Consensus R1 (90:10:0)		
	It is an opportunity to change mindsets and historic practices of doctors with regard to blood transfusions.	Consensus R1 (100:0:0)		
	It is an approach to conserving donor blood, which is a scarce resource.	Consensus R1 (90:10:0)		
	It encourages rational blood use thus preventing unnecessary transfusions.	Consensus R1 (90:10:0)		
	It can reduce morbidity & mortality.	Consensus R1 (80:20:0)		
	It is a means to avoid and reduce transfusion adverse effects.	Consensus R3 (90:10:0)		
	It encourages research-driven improved clinical practices.		Consensus R3 (20:80:0)	
	It would make doctors more vigilant about their clinical approach to anaemia prevention and treatment.	Consensus R1 (100:0:0)		
	It offers financial benefits to patients and the healthcare system.	Consensus R2 (100:0:0)		
	PBM implementation is achievable and South Africa can do it.	Consensus R1 (90:10:0)		
	Implementation of PBM pillar one is a good enough start for South Africa.	Consensus R3 (80:20:0)		

2	Need for a PBM toolkit in South Africa In professional education, a 'toolkit' is defined as a resource that helps a professional improve his or her competence knowledge, or skills. For this study, a PBM toolkit will comprise a host of guidance resources serving as tools to aid clinicians in detecting and managing anaemia, bleeding and blood loss in patients.			
	How would you rate the following reasons why a PBM tool kit is needed in hospitals in South Africa?	Essential	Useful	Unnecessary
	A toolkit will help to jumpstart PBM implementation in South Africa.	Consensus R2 (80:20:0)		
	A toolkit will serve as a driver to align clinical practices to the pillars of PBM.	Consensus R1 (80:20:0)		
	A toolkit will make PBM practically doable.	Consensus R1 (80:20:0)		
	It will serve as a quality improvement approach to patient care and overall healthcare.	Consensus R2 (80:20:0)		
	A toolkit will enable the empowerment of healthcare workers by creating better awareness and improved knowledge of PBM.	Consensus R1 (80:20:0)		
	It will serve as an educational platform for continuous medical education.	Consensus R2 (100:0:0)		
	It will encourage clinically appropriate practices.	Consensus R1 (100:0:0)		
	A toolkit will provide guidance and support for junior doctors.	Consensus R1 (100:0:0)		
	It will provide quick clinical guidance as needed in a time constraint working environment.	Consensus R1 (90:10:0)		
	It will encourage accountability in clinical decision-making.	Consensus R2 (90:10:0)		
	It will help to change the historic culture of inappropriate transfusion practices.	Consensus R1 (80:20:0)		
	It will encourage the use of blood conservation approaches.	Consensus R1 (80:10:10)		
	It will serve as encouragement for application of best practice recommendations.	Consensus R1 (80:20:0)		

3	Audit of blood and blood product use	Essential	Useful	Unnecessary
3.1	How would you rate the need to monitor/audit the use of blood and blood products in hospitals?	Consensus R1 (90:10:0)		
3.2	Who should monitor the usage of blood products?	Essential	Useful	Unnecessary
	Blood Services	Consensus R2 (90:10:0)		
	Hospital management	Consensus R2 (80:20:0)		
	Transfusion practitioner appointed for the hospital	Consensus R3 (80:20:0)		
	Hospital-appointed transfusion/PBM nurse	No consensus	No consensus	<i>Stability (55:45:0) (1 participant changed their response)</i>
	Blood users committee/PBM committee/hospital transfusion committee	Consensus R1 (90:10:0)		
	Heads of each department	Consensus R3 (80:20:0)		
	Department of Health	No consensus	No consensus	<i>Stability (50:30:20) (1 participant changed their response)</i>

SECTION C: Guidance resources needed as tools for a PBM toolkit appropriate for primary, secondary, and tertiary level hospitals/healthcare facilities respectively in South Africa.

This section deals with selecting the essential, cost-effective, feasible, best practice, evidence-based measures and resources as clinical practice tools for a PBM toolkit appropriate for Primary, Secondary and Tertiary level hospitals/healthcare facilities in South Africa.

4.1.a Tools for detection and management of anaemia	Primary healthcare setting			Secondary healthcare setting			Tertiary healthcare setting		
	Essential (1)	Useful (2)	Unnecessary (3)	Essential (1)	Useful (2)	Unnecessary (3)	Essential (1)	Useful (2)	Unnecessary (3)
Anaemia detection algorithms/flowcharts.	Consensus R1 (90:10:0)			Consensus R1 (90:10:0)			Consensus R2 (90:10:0)		
Flowcharts for the selection of the appropriate laboratory tests (When to order what tests?).	Consensus R1 (90:10:0)			Consensus R1 (90:10:0)			Consensus R1 (80:20:0)		
Identifying the underlying causes of anaemia.	Consensus R1 (80:20:0)			Consensus R1 (100:0:0)			Consensus R1 (90:10:0)		
Treating underlying causes - anaemia management algorithms with scenarios wherever possible.	Consensus R1 (90:10:0)			Consensus R1 (90:10:0)			Consensus R1 (80:20:0)		
List of drugs that cause anaemia.	<i>Stability (40:60:0) (1 participant changed their response)</i>			Consensus R3 (80:20:0)			Consensus R2 (80:20:0)		
When to refer patients for further evaluation.	Consensus R1 (100:0:0)			Consensus R2 (90:10:0)			Consensus R2 (0:100:0)		
4.1.b Iron-deficiency anaemia diagnosis and treatment tools - Advice on the following:	Primary healthcare setting			Secondary healthcare setting			Tertiary healthcare setting		
	Essential (1)	Useful (2)	Unnecessary (3)	Essential (1)	Useful (2)	Unnecessary (3)	Essential (1)	Useful (2)	Unnecessary (3)
The importance of serum ferritin screening on patients.	Consensus R1 (80:20:0)			Consensus R1 (90:10:0)			Consensus R1 (80:20:0)		
Information on the use and interpretation of iron studies.	Consensus R1 (80:10:10)			Consensus R1 (100:0:0)			Consensus R1 (90:10:0)		
<i>Fasting samples must be taken for reliable iron study results.</i>									
Prescribing oral iron: How and when it should be taken.	Consensus R1 (100:0:0)			Consensus R1 (100:0:0)			Consensus R2 (90:10:0)		
Monitoring patients on oral iron treatment.	Consensus R1 (90:10:0)			Consensus R1 (90:10:0)			Consensus R1 (80:20:0)		
Information on prevention and management of the side effects of oral iron.	Consensus R1 (90:10:0)			Consensus R1 (100:0:0)			Consensus R1 (80:20:0)		
4.1.c IV Iron tools	Primary healthcare setting			Secondary healthcare setting			Tertiary healthcare setting		
	Essential (1)	Useful (2)	Unnecessary (3)	Essential (1)	Useful (2)	Unnecessary (3)	Essential (1)	Useful (2)	Unnecessary (3)
Demystify IV iron use – Provide scientific basis that argues against the myths.	Consensus R3 (90:10:0)			Consensus R1 (100:0:0)			Consensus R1 (100:0:0)		
Indications for IV iron.	Consensus R3 (90:10:0)			Consensus R1 (100:0:0)			Consensus R1 (90:10:0)		
IV iron - administration, timing and dosage.	Consensus R3 (90:10:0)			Consensus R1 (100:0:0)			Consensus R1 (90:10:0)		
IV iron - Preventing and managing adverse events.	Consensus R3 (90:10:0)			Consensus R1 (100:0:0)			Consensus R1 (100:0:0)		
Digital forms to simplify the motivation for IV iron to funders.	<i>Stability (10:60:20) (No change in participant responses)</i>			Consensus R3 (80:20:0)			Consensus R2 (90:10:0)		

4.1.d HIV-related anaemia tools	Primary healthcare setting			Secondary healthcare setting			Tertiary healthcare setting		
	Essential (1)	Useful (2)	Unnecessary (3)	Essential (1)	Useful (2)	Unnecessary (3)	Essential (1)	Useful (2)	Unnecessary (3)
Simplified diagnostic approach to anaemia in HIV-infected individuals.	Consensus R1 (90:10:0)			Consensus R1 (90:10:0)			Consensus R1 (80:20:0)		
Risk factors associated with anaemia in HIV infection (history of clinical AIDS, CD4 cell count of 200 cells/ml, plasma viral load, women, Zidovudine use, increasing age, lower body mass index, history of bacterial pneumonia, oral candidiasis, history of fever, etc.)	Consensus R2 (100:0:0)			Consensus R1 (80:20:0)			Consensus R1 (80:20:0)		
The major causes of HIV-related anaemia	Consensus R2 (100:0:0)			Consensus R1 (90:10:0)			Consensus R1 (80:20:0)		
Drugs that commonly cause myelosuppression in HIV-infected patients.	Consensus R2 (100:0:0)			Consensus R1 (100:0:0)			Consensus R1 (80:20:0)		
Identify and correct the treatable causes of anaemia in HIV-infected patients.	Consensus R1 (80:20:0)			Consensus R1 (80:20:0)			Consensus R1 (80:20:0)		
Manage anaemia of inflammatory disease (previously termed anaemia of chronic disease) as a cause of HIV-related anaemia.	Consensus R2 (100:0:0)			Consensus R1 (90:10:0)			Consensus R1 (80:20:0)		
Vigilance in the treatment of opportunistic infections to which HIV-positive patients are susceptible that can lead to anaemia.	Consensus R1 (80:20:0)			Consensus R1 (80:20:0)			Consensus R1 (80:20:0)		
Malignancies that can lead to anaemia.	Consensus R3 (90:10:0)			Consensus R1 (80:10:10)			Consensus R1 (80:10:10)		
What are the current treatment guidelines for anaemia in HIV-infected persons.	Consensus R1 (90:10:0)			Consensus R1 (90:10:0)			Consensus R1 (80:20:0)		
Interpretation of iron studies in HIV patients.	Consensus R2 (100:0:0)			Consensus R1 (90:10:0)			Consensus R1 (80:20:0)		
Use of HAART (Highly Active Antiretroviral Therapy) - the impact of various HAART regimens on anaemia.	Consensus R1 (80:20:0)			Consensus R1 (90:10:0)			Consensus R1 (80:20:0)		
Anaemia in the HIV population should never be regarded as "normal" and a patient who continues to be anaemic after effective ART should be investigated for other causes of the anaemia.	Consensus R1 (90:10:0)			Consensus R1 (90:10:0)			Consensus R1 (80:20:0)		
Use of recombinant erythropoietin such as erythropoietin alfa.	<i>Stability (40:60:0) (No change in participant responses)</i>			Consensus R3 (20:80:0)			Consensus R1 (80:20:0)		
Considerations for blood transfusion in patients with the HIV-related anaemia	Consensus R3 (0:100:0)			Consensus R1 (90:10:0)			Consensus R1 (90:10:0)		
30% of patients living with HIV can have a positive Coombs' test. Positive Coombs' test makes cross-matching difficult, so that only the "least incompatible" blood can be issued. The importance of weighing the risk of transfusing "least incompatible" needs to be considered.	Consensus R3 (0:80:20)			Consensus R2 (80:20:0)			Consensus R2 (90:10:0)		

4.2 Policies/protocols/standard operating procedures needed as tools	Primary healthcare setting			Secondary healthcare setting			Tertiary healthcare setting		
	Essential (1)	Useful (2)	Unnecessary (3)	Essential (1)	Useful (2)	Unnecessary (3)	Essential (1)	Useful (2)	Unnecessary (3)
Anaemia management protocol.	Consensus R1 (80:20:0)			Consensus R1 (100:0:0)			Consensus R1 (80:20:0)		
Diagnosis of anaemia.	Consensus R1 (90:10:0)			Consensus R1 (100:0:0)			Consensus R1 (80:20:0)		
Screening for anaemia protocol.	Consensus R1 (90:10:0)			Consensus R1 (100:0:0)			Consensus R1 (80:20:0)		
Preoperative anaemia optimisation protocol.	Consensus R3 (80:10:10)			Consensus R1 (100:0:0)			Consensus R1 (100:0:0)		
Preoperative evaluation for bleeding risk.	Consensus R2 (80:0:20)			Consensus R1 (100:0:0)			Consensus R1 (100:0:0)		
Intraoperative coagulation assessment.	<i>Stability (0:40:60) (1 participant changed their response)</i>			Consensus R1 (90:10:0)			Consensus R1 (100:0:0)		
Postoperative assessment of bleeding risk.	<i>Stability (10:30:60) (1 participant changed their response)</i>			Consensus R1 (100:0:0)			Consensus R1 (100:0:0)		
Management of anticoagulants in the peri-operative period.	Consensus R3 (0:80:20)			Consensus R1 (100:0:0)			Consensus R1 (100:0:0)		
Bridging anticoagulation guidelines.	Consensus R3 (20:80:0)			Consensus R1 (100:0:0)			Consensus R1 (100:0:0)		
Use of point-of-care coagulation testing and interpretation, e.g., TEG, ROTEM.	Consensus R2 (0:20:80)			<i>Stability (45:45:0) (1 participant changed their response)</i>			Consensus R1 (90:10:0)		
Massive bleeding (general): Massive haemorrhage protocol.	Consensus R3 (90:10:0)			Consensus R1 (100:0:0)			Consensus R1 (100:0:0)		
Management of postpartum haemorrhage.	Consensus R1 (90:10:0)			Consensus R1 (100:0:0)			Consensus R1 (90:10:0)		
Point-of-care coagulation testing.	<i>Stability (0:30:70) (2 participants changed their response)</i>			<i>Stability (60:40:0) (2 participants changed their response)</i>			Consensus R1 (80:20:0)		
Management of trauma-associated haemorrhage.	Consensus R2 (90:10:0)			Consensus R1 (100:0:0)			Consensus R1 (100:0:0)		
Blood ordering, blood product indications and blood usage policy.	Consensus R3 (80:20:0)			Consensus R1 (100:0:0)			Consensus R1 (100:0:0)		
Cardiac surgery-associated haemorrhage.	Consensus R1 (0:10:90)			Consensus R2 (0:100:0)			Consensus R1 (100:0:0)		
Discipline-specific PBM / transfusion guidelines.	<i>Stability (0:30:70) (1 participant changed their response)</i>			<i>Stability (30:60:10) (2 participants changed their response)</i>			Consensus R1 (80:20:0)		
Guidelines for blood ordering at hospitals with no onsite blood banks.	Consensus R3 (90:10:0)			Consensus R2 (90:10:0)			Consensus R2 (80:20:0)		
Blood conservation approaches.	<i>Stability (55:0:45) (1 participant changed their response)</i>			Consensus R1 (80:20:0)			Consensus R1 (90:10:0)		
Blood management at hospitals with no onsite blood banks.	Consensus R2 (80:10:10)			Consensus R2 (100:0:0)			Consensus R2 (80:20:0)		
How to use point-of-care equipment - Do's and Don'ts.	Consensus R2 (80:0:20)			Consensus R2 (100:0:0)			Consensus R1 (90:10:0)		
TEG protocol.	Consensus R2 (10:10:80)			<i>Stability (60:30:10) (1 participant changed their response)</i>			Consensus R1 (80:20:0)		
Guidelines for when to refer patients to the Haematologist	Neither consensus nor stability (55:45:0) (3 participants changed their response)			Consensus R1 (80:20:0)			Consensus R1 (80:20:0)		
Guidelines for when to refer patients to the Gastroenterologist.	<i>Stability (40:60:0) (1 participant changed their response)</i>			Consensus R2 (100:0:0)			Consensus R2 (100:0:0)		

Guidelines for when to refer patients to the Gynaecologist.	Consensus R3 (80:20:0)	Consensus R1 (80:20:0)	Consensus R2 (100:0:0)
Guideline for management of cancer-related anaemia.	<i>Stability (20:45:35) (1 participant changed their response)</i>	Consensus R2 (80:20:0)	Consensus R1 (90:10:0)
Policy for the management of HIV-related anaemia.	Consensus R1 (80:20:0)	Consensus R1 (90:10:0)	Consensus R1 (80:20:0)
4.3 Tools for a complete care paradigm for women	Primary healthcare setting	Secondary healthcare setting	Tertiary healthcare setting
	Essential (1) Useful (2) Unnecessary (3)	Essential (1) Useful (2) Unnecessary (3)	Essential (1) Useful (2) Unnecessary (3)
Guidelines for monitoring iron levels in obstetric patients.	Consensus R1 (90:10:0)	Consensus R1 (100:0:0)	Consensus R1 (90:10:0)
Management of iron deficiency in obstetric patients.	Consensus R1 (100:0:0)	Consensus R1 (100:0:0)	Consensus R1 (90:10:0)
Checking iron levels 6 weeks postpartum.	Consensus R2 (100:0:0)	Consensus R1 (80:20:0)	Consensus R2 (90:10:0)
Postoperative iron protocol for Caesarean sections	Consensus R1 (80:10:10)	Consensus R1 (90:10:0)	Consensus R1 (80:20:0)
Guideline for PBM in obstetric bleeding emergencies.	Consensus R1 (90:0:10)	Consensus R1 (100:0:0)	Consensus R1 (100:0:0)
Checking iron and ferritin levels following treatment of anaemia caused by heavy menstrual bleeding.	Consensus R2 (100:0:0)	Consensus R1 (80:20:0)	Consensus R1 (80:20:0)
Guidelines for referral of patients for workup of anaemia.	Consensus R3 (100:0:0)	Consensus R1 (80:20:0)	Consensus R1 (80:20:0)
Iron treatment in pregnancy protocol.	Consensus R1 (80:20:0)	Consensus R1 (90:10:0)	Consensus R1 (100:0:0)
4.4 Tools for minimising iatrogenic blood loss	Primary healthcare setting	Secondary healthcare setting	Tertiary healthcare setting
	Essential (1) Useful (2) Unnecessary (3)	Essential (1) Useful (2) Unnecessary (3)	Essential (1) Useful (2) Unnecessary (3)
Microsampling / microbleeding (smaller volume blood sample collection) benefits.	Consensus R3 (0:90:10)	Consensus R2 (90:10:0)	Consensus R2 (90:10:0)
Avoiding unnecessary repeat laboratory testing.	Consensus R2 (80:10:10)	Consensus R1 (90:10:0)	Consensus R1 (100:0:0)
4.5 Tools for preoperative, intra-operative and postoperative patient care. Advice on:	Primary healthcare setting	Secondary healthcare setting	Tertiary healthcare setting
	Essential (1) Useful (2) Unnecessary (3)	Essential (1) Useful (2) Unnecessary (3)	Essential (1) Useful (2) Unnecessary (3)
Preoperative anaemia optimisation.	Consensus R3 (80:20:0)	Consensus R1 (90:10:0)	Consensus R1 (90:10:0)
Management of iron-deficiency anaemia in surgical patients (preop, intraop and postop).	Consensus R3 (80:20:0)	Consensus R1 (100:0:0)	Consensus R1 (100:0:0)
Postoperative patient care guidelines.	Neither consensus nor stability (40:60:0) (3 participants changed their response)	Consensus R1 (90:10:0)	Consensus R1 (90:10:0)
Surgical considerations (haemostasis, lowering blood pressure, normothermia).	Consensus R3 (10:10:80)	Consensus R1 (80:20:0)	Consensus R1 (80:20:0)
Meticulous haemostasis and surgical techniques.	Consensus R3 (10:10:80)	Consensus R1 (90:10:0)	Consensus R1 (90:10:0)
Blood-sparing surgical techniques.	<i>Stability (10:20:70) (2 participants changed their response)</i>	Consensus R1 (80:20:0)	Consensus R1 (80:20:0)

Anaesthetic blood-conserving strategies.	Neither consensus nor stability (10:20:70) (3 participants changed their response)	Consensus R1 (80:20:0)	Consensus R1 (90:10:0)
Vigilant monitoring and management of postoperative bleeding.	<i>Stability (60:30:10)</i> (2 participants changed their response)	Consensus R1 (90:10:0)	Consensus R1 (80:20:0)
Preventing secondary post-operative haemorrhage.	<i>Stability (60:30:10)</i> (2 participants changed their response)	Consensus R1 (90:10:0)	Consensus R1 (80:20:0)
Avoid/treat infections promptly.	Consensus R2 (90:10:0)	Consensus R1 (80:10:10)	Consensus R2 (100:0:0)
Indications and contraindications for intraoperative/postoperative autologous blood collection and re-transfusion.	Consensus R2 (0:10:90)	Consensus R3 (10:90:0)	Consensus R2 (80:20:0)
Use of autologous blood donation	Consensus R2 (0:20:80)	Consensus R3 (0:100:0)	Consensus R3 (10:90:0)
Cell salvage protocols.	Consensus R3 (0:20:80)	Consensus R3 (80:10:10)	Consensus R1 (100:0:0)
Videos on cell salvage methodology.	<i>Stability (0:30:70)</i> (No change in participant responses)	<i>Stability (45:45:10)</i> (No change in participant responses)	Consensus R2 (100:0:0)
Bleeding assessment tools.	<i>Stability (70:20:10)</i> (2 participants changed their response)	Consensus R1 (90:10:0)	Consensus R1 (90:10:0)
Bleeding management tools.	Consensus R2 (90:10:0)	Consensus R1 (80:20:0)	Consensus R1 (90:10:0)
Blood loss formula calculator for predicting blood loss.	Neither consensus nor stability (45:35:20) (4 participants changed their response)	Consensus R3 (80:20:0)	Consensus R3 (100:0:0)
List of medications and supplements that cause bleeding.	Consensus R2 (90:10:0)	Consensus R1 (80:20:0)	Consensus R1 (80:20:0)
Screening patients that are at high risk for bleeding.	Consensus R2 (90:10:0)	Consensus R1 (100:0:0)	Consensus R1 (100:0:0)
Monitoring patients on anticoagulant/anti-platelet therapy.	Consensus R3 (80:20:0)	Consensus R1 (100:0:0)	Consensus R1 (100:0:0)
Limiting dilutional coagulopathy - Guidance on crystalloid use and dangers of overuse.	Consensus R3 (90:0:10)	Consensus R1 (80:20:0)	Consensus R1 (80:20:0)
Early postoperative feeding versus upper GI haemorrhage prophylaxis.	<i>Stability (0:45:55)</i> (No change in participant responses)	Consensus R3 (80:20:0)	Consensus R1 (80:20:0)
Use of erythropoietin.	<i>Stability (0:30:70)</i> (2 participants changed their response)	<i>Stability (40:60:0)</i> (2 participants changed their response)	Consensus R1 (80:20:0)
<i>Use of aprotinin.</i>			
Use of tranexamic acid.	Consensus R2 (80:20:0)	Consensus R1 (100:0:0)	Consensus R1 (100:0:0)
Optimise cardiac output.	Consensus R3 (10:80:10)	Consensus R2 (100:0:0)	Consensus R2 (100:0:0)
Optimise ventilation and oxygenation.	Consensus R3 (0:80:20)	Consensus R2 (90:10:0)	Consensus R2 (100:0:0)
Optimise anaemia reserve.	<i>Stability (45:55:0)</i> (1 participant changed their response)	Consensus R2 (90:10:0)	Consensus R2 (100:0:0)
Maximise oxygen delivery.	<i>Stability (60:40:0)</i> (2 participants changed their response)	Consensus R2 (90:10:0)	Consensus R2 (90:10:0)

Minimise oxygen consumption.	<i>Stability (20:70:10)</i> <i>(1 participant changed their response)</i>	Consensus R2 (90:10:0)	Consensus R2 (80:20:0)
Prescribing pain medication with considerations for bleeding risk, e.g. NSAIDS, aspirin, etc.	Consensus R2 (100:0:0)	Consensus R1 (80:20:0)	Consensus R1 (80:20:0)

4.6 Transfusion decision-making tools.	Primary healthcare setting			Secondary healthcare setting			Tertiary healthcare setting		
	Essential (1)	Useful (2)	Unnecessary (3)	Essential (1)	Useful (2)	Unnecessary (3)	Essential (1)	Useful (2)	Unnecessary (3)
Products, services and testing offered by the Blood Services.	Consensus R2 (80:20:0)			Consensus R1 (90:10:0)			Consensus R1 (90:10:0)		
Transfusion risks and hazards.	Consensus R2 (80:20:0)			Consensus R1 (80:20:0)			Consensus R1 (80:20:0)		
Cost of blood and blood products, including surcharges and levies for emergency and out-of-hours testing and services.	<i>Stability (60:40:10)</i> <i>(No change in participant responses)</i>			Consensus R1 (80:20:0)			Consensus R1 (80:20:0)		
Restrictive transfusion thresholds.	Consensus R2 (80:20:0)			Consensus R1 (90:10:0)			Consensus R1 (90:10:0)		
Single-unit transfusion focus - transfuse and assess strategy.	Consensus R2 (90:10:0)			Consensus R1 (100:0:0)			Consensus R1 (100:0:0)		
4.7 Tools to assist hospitals in setting up PBM programmes									
Guidelines for setting up healthcare setting appropriate PBM programme.	Consensus R2 (100:0:0)			Consensus R1 (100:0:0)			Consensus R1 (100:0:0)		
Self-audit guidelines and checklists.	Consensus R2 (80:20:0)			Consensus R1 (80:20:0)			Consensus R1 (80:20:0)		
PBM readiness checklists for hospitals to serve as a needs analysis	<i>Stability (60:40:10)</i> <i>(No change in participant responses)</i>			Consensus R1 (80:20:0)			Consensus R1 (80:20:0)		
Setting metrics/targets – measures to see if set PBM targets are being met.	<i>Stability (30:70:0)</i> <i>(1 participant changed their response)</i>			Consensus R2 (80:20:0)			Consensus R2 (80:20:0)		
Transfusion control measures – control measures for when patients should be transfused to ensure patients are transfused only when clinically necessary.	Consensus R2 (80:20:0)			Consensus R1 (80:20:0)			Consensus R1 (80:20:0)		
PBM checklists for patient history taking, e.g. has the patient had a full blood count in the last six weeks, has the patient had an iron study, does the patient have the following symptoms, did the patient bleed intraoperatively? How much do you think the patient bled? Postoperative bleeding?	Consensus R2 (80:20:0)			Consensus R2 (90:10:0)			Consensus R2 (90:10:0)		
Easy access templates for hospitals to write their PBM-related protocols.	Consensus R3 (80:20:0)			Consensus R1 (80:20:0)			Consensus R1 (80:20:0)		
Templates/checklists to identify bleeding risk.	<i>Stability (70:30:0)</i> <i>(1 participant changed their response)</i>			Consensus R2 (100:0:0)			Consensus R2 (100:0:0)		
Laboratory tools – List of tests to request for bleeding disorders.	<i>Stability (55:45:0)</i> <i>(1 participant changed their response)</i>			Consensus R2 (100:0:0)			Consensus R1 (80:20:0)		
Laboratory tools – List of tests for detection of anaemia and when to request which tests.	Consensus R2 (90:10:0)			Consensus R2 (100:0:0)			Consensus R2 (100:0:0)		

Laboratory awareness tools – What do elevated and/or decreased test results mean.	Consensus R3 (80:20:0)	Consensus R2 (100:0:0)	Consensus R2 (100:0:0)
Guidance on how to set up pre-operative anaemia and bleeding clinic.	Consensus R3 (80:10:10)	Consensus R1 (80:20:0)	Consensus R1 (80:20:0)
Referenced literature providing evidence base for PBM implementation in South Africa, low- and middle-income countries and global.	<i>Stability (55:35:10) (No change in participant responses)</i>	Consensus R2 (80:20:0)	Consensus R1 (80:10:10)
How to set up hospital transfusion committee/blood-user committee/PBM committee.	Consensus R3 (10:90:0)	Consensus R1 (90:10:0)	Consensus R1 (90:10:0)
Standing meeting agenda templates for hospital transfusion committee/blood-user committee/PBM committee meetings.	Consensus R2 (10:90:0)	Neither consensus nor stability (40:60:0) (3 participants changed their response)	Consensus R3 (90:10:0)
Committee representation guidelines for hospital transfusion committee/blood-user committee/PBM committee.	Consensus R2 (10:80:10)	Consensus R3 (20:80:0)	<i>Stability (30:70:0) (1 participant changed their response)</i>
Standardised blood accountability forms.	Neither consensus nor stability (30:70:0) (3 participants changed their response)	Consensus R1 (80:20:0)	Consensus R1 (80:20:0)
Comprehensive informed consent documents for blood transfusion.	Consensus R3 (100:0:0)	Consensus R1 (90:10:0)	Consensus R1 (90:10:0)
Code of conduct for ordering and administering transfusions.	Consensus R3 (90:10:0)	Consensus R2 (80:20:0)	Consensus R2 (80:20:0)
Audit tools (How to carry out an audit, e.g. transfusion use, iron reactions, etc.).	Neither consensus nor stability (30:70:0) (3 participants changed their response)	Consensus R3 (90:10:0)	Consensus R2 (80:20:0)
Implementing electronic blood-ordering systems.	<i>Stability (0:60:40) (2 participants changed their response)</i>	Consensus R3 (20:80:0)	<i>Stability (55:45:0) (1 participant changed their response)</i>
Guidance on how to implement policies/protocols/guidelines.	<i>Stability (55:45:0) (1 participant changed their response)</i>	<i>Stability (60:40:0) (1 participant changed their response)</i>	Consensus R3 (80:20:0)
4.8 Other tools	Primary healthcare setting		
	Essential (1)	Useful (2)	Unnecessary (3)
Secondary healthcare setting	Secondary healthcare setting		
	Essential (1)	Useful (2)	Unnecessary (3)
Tertiary healthcare setting	Tertiary healthcare setting		
	Essential (1)	Useful (2)	Unnecessary (3)
Blood-ordering form should include questions on whether alternate approaches other than transfusion have been considered for the patient.	Consensus R3 (10:90:0)	Consensus R2 (80:20:0)	Consensus R2 (90:10:0)
Blood usage/monitoring dashboard (one could login to a common portal and view blood usage of hospitals).	Consensus R2 (10:80:10)	Consensus R3 (10:90:0)	<i>Stability (30:70:40) (2 participants changed their response)</i>
Share PBM success stories (local and global).	Consensus R3 (20:80:0)	<i>Stability (70:30:0) (No change in participant responses)</i>	<i>Stability (70:30:0) (No change in participant responses)</i>
Questions and Answers platform, e.g. PBM WhatsApp group.	Consensus R2 (10:80:10)	Consensus R3 (10:90:0)	Consensus R3 (20:80:0)
Information alerts giving updates on changes in clinical practices or changes in protocols/procedures.	Consensus R3 (10:90:0)	<i>Stability (70:30:0) (1 participant changed their response)</i>	<i>Stability (70:30:0) (1 participant changed their response)</i>

5. How would you rate the importance of the following PBM modalities in Primary, Secondary and Tertiary healthcare facilities respectively in South Africa

	Primary healthcare setting			Secondary healthcare setting			Tertiary healthcare setting		
	Essential (1)	Useful (2)	Unnecessary (3)	Essential (1)	Useful (2)	Unnecessary (3)	Essential (1)	Useful (2)	Unnecessary (3)
Oral iron	Consensus R1 (100:0:0)			Consensus R1 (90:10:0)			Consensus R1 (80:20:0)		
IV iron	<i>Stability (60:40:0) (No change in participant responses)</i>			Consensus R1 (90:10:0)			Consensus R1 (100:0:0)		
Erythropoietin	<i>Stability (0:40:60) (No change in participant responses)</i>			<i>Stability (45:55:0) (1 participant changed their response)</i>			Consensus R1 (90:10:0)		
Tranexamic acid	Consensus R1 (80:20:0)			Consensus R1 (90:10:0)			Consensus R1 (90:10:0)		
Intraoperative normovolaemic haemodilution	Consensus R3 (10:0:90)			<i>Stability (40:60:0) (2 participants changed their response)</i>			<i>Stability (60:40:0) (No change in participant responses)</i>		
Cell salvage equipment.	Consensus R3 (0:20:80)			<i>Stability (70:30:0) (No change in participant responses)</i>			Consensus R1 (100:0:0)		
Optimising anaemia before elective surgery.	Consensus R2 (80:20:0)			Consensus R1 (100:0:0)			Consensus R1 (100:0:0)		
Single-unit transfusions	Consensus R2 (90:0:10)			Consensus R1 (90:10:0)			Consensus R1 (100:0:0)		
Blood-accountability forms.	Consensus R3 (80:20:0)			Consensus R2 (100:0:0)			Consensus R1 (80:20:0)		
Motivation for blood transfusion.	Consensus R2 (80:10:10)			Consensus R2 (80:20:0)			Consensus R2 (90:10:0)		
Point-of-care testing (POCT) Haemoglobin	Consensus R1 (90:10:0)			Consensus R1 (90:10:0)			Consensus R1 (90:10:0)		
POCT Haematocrit	<i>Stability (50:20:30) (1 participant changed their response)</i>			<i>Stability (50:40:10) (2 participants changed their response)</i>			<i>Stability (40:50:10) (No change in participant responses)</i>		
POCT INR	<i>Stability (45:45:10) (1 participant changed their response)</i>			Consensus R3 (90:10:0)			Consensus R3 (90:10:0)		
POCT Platelet Function	<i>Stability (0:40:60) (1 participant changed their response)</i>			<i>Stability (45:35:20) (No change in participant responses)</i>			Consensus R3 (80:20:0)		
POCT intraoperative coagulation monitoring (e.g., ROTEM or TEG)	Consensus R1 (10:10:80)			<i>Stability (60:30:10) (2 participants changed their response)</i>			Consensus R2 (80:20:0)		

6. Toolkit look & feel: Please rate the following options in terms of how the toolkit should be made available for practical access and use	Essential	Useful	Unnecessary
All-inclusive package including videos, diagrams, lectures/podcasts, policies, procedures, templates, etc.		Consensus R3 (10:90:0)	
Digital/electronic toolkit with all of the above.	Consensus R1 (80:20:0)		
Physical/paper-based toolkit with all of the above.	Consensus R2 (90:10:0)		
Should be a combination of digital and physical.	Consensus R2 (90:10:0)		
Should be in a poster format.	Consensus R2 (20:80:0)		
There should be separate toolkits for public and private sector hospitals.	<i>Stability (0:30:70) (1 participant changed their response)</i>		
There should be a PBM toolkit specific for nurses.	Consensus R3 (90:0:10)		

SECTION D: PBM education deficiencies and education failures that need to be addressed.		
This section deals with the PBM knowledge deficiencies and education failures that need to be addressed among the various stakeholder groups.		
7.1 Please rate the importance of addressing the following PBM knowledge deficiencies among DOCTORS and NURSES respectively		
a. General aspects of PBM	Doctors	Nurses
PBM definition and benefits of PBM.	Consensus R1 (100:0:0)	Consensus R1 (100:0:0)
PBM pillars – What do they mean and how to apply them.	Consensus R1 (100:0:0)	Consensus R1 (90:10:0)
Multidisciplinary care paradigm.	Consensus R1 (100:0:0)	Consensus R1 (90:10:0)
Knowledge of haemostasis.	Consensus R1 (90:10:0)	<i>Stability (70:30:0) (2 participants changed their response)</i>
Role of the nurse in PBM and importance of role empowerment.	Consensus R1 (80:20:0)	Consensus R1 (100:0:0)
Role of the laboratory in PBM.	Consensus R1 (80:20:0)	<i>Stability (70:30:0) (2 participants changed their response)</i>
Management and optimal use of resources in resource-constrained healthcare settings.	Consensus R1 (90:10:0)	Consensus R1 (90:10:0)
b. Anaemia workup and diagnosis		
Anaemia is treatable.	Consensus R1 (100:0:0)	Consensus R1 (100:0:0)
Approaches to early diagnosis and treatment.	Consensus R1 (100:0:0)	Consensus R1 (100:0:0)
When to order which laboratory tests.	Consensus R1 (100:0:0)	<i>Stability (70:30:0) (1 participant changed their response)</i>
Understanding laboratory test results.	Consensus R1 (100:0:0)	<i>Stability (70:30:0) (1 participant changed their response)</i>
Consequences of anaemia.	Consensus R1 (90:10:0)	Consensus R1 (90:10:0)
Medications that cause anaemia.	Consensus R1 (80:20:0)	Consensus R3 (80:20:0)
Consequences of iron-deficiency anaemia on women and children.	Consensus R1 (90:10:0)	Consensus R1 (90:10:0)
Managing obstetric emergencies.	Consensus R1 (90:10:0)	Consensus R1 (90:10:0)
c. Blood banking		
Knowledge of blood and blood products and their indications.	Consensus R1 (90:10:0)	Consensus R3 (100:0:0)
Blood ordering – When to order which products.	Consensus R1 (90:10:0)	<i>Stability (45:55:0) (No change in participant responses)</i>
Blood transfusion is not the first-choice treatment for anaemia.	Consensus R1 (100:0:0)	Consensus R2 (90:10:0)
Cost of blood and blood products.	Consensus R1 (80:20:0)	Consensus R3 (80:20:0)
Cost of testing (various crossmatch types) including out-of- hours levies/surcharges.	Consensus R2 (80:20:0)	<i>Stability (30:60:10) (1 participant changed their response)</i>
Blood wastage - Blood Service and Health Service implications.	Consensus R2 (100:0:0)	Consensus R3 (80:20:0)
Ordering blood on a returnable basis (BRB) benefits.	Consensus R2 (100:0:0)	Consensus R3 (80:20:0)
Appropriate storage of blood and blood products.	Consensus R2 (100:0:0)	Consensus R1 (80:20:0)
Appropriate use of blood and blood products.	Consensus R1 (100:0:0)	Consensus R1 (90:10:0)
Difference between PBM and blood conservation.	Consensus R2 (80:20:0)	Consensus R3 (80:20:0)
HIV-related anaemia management.	Consensus R1 (90:10:0)	Consensus R2 (80:20:0)

d. Ethical aspects		
Ethical aspects of the use of blood and blood products.	Consensus R1 (80:20:0)	Consensus R2 (80:20:0)
Process for informed consent.	Consensus R1 (100:0:0)	Consensus R2 (100:0:0)
Doing enough and what is best for patients – patient-specific considerations.	Consensus R1 (80:20:0)	Consensus R1 (80:20:0)
Autonomy and patients' rights.	Consensus R1 (90:10:0)	Consensus R1 (90:10:0)
Medico-legal implications of inappropriate anaemia management.	Consensus R1 (80:20:0)	Consensus R3 (100:0:0)
Medico-legal implications of inappropriate blood transfusions.	Consensus R1 (80:20:0)	Consensus R3 (100:0:0)
Taking the time to give patients appropriate clinical advice.	Consensus R1 (90:10:0)	Consensus R1 (80:20:0)
Making time for patient education and empowerment.	Consensus R2 (90:10:0)	Consensus R1 (80:20:0)
Ethical imperative for PBM.	Consensus R2 (100:0:0)	Consensus R2 (80:20:0)
e. Clinical aspects		
Clinically appropriate transfusion decision making (Moving away from knee-jerk reactions to a more informed approach).	Consensus R1 (100:0:0)	Consensus R2 (80:20:0)
Transfusion risks and hazards.	Consensus R1 (100:0:0)	Consensus R1 (80:20:0)
Restrictive transfusion thresholds.	Consensus R1 (90:10:0)	Consensus R2 (90:10:0)
Adequate assessment of patients – Taking proper history is important for PBM.	Consensus R1 (80:20:0)	Consensus R2 (90:10:0)
How to administer and monitor blood transfusions.	Consensus R1 (90:10:0)	Consensus R1 (100:0:0)
Four-hour rule (transfusion should not exceed four hours from start of the infusion).	Consensus R1 (90:10:0)	Consensus R1 (90:10:0)
Early patient referrals.	Consensus R1 (80:10:10)	Consensus R2 (90:0:10)
Single-unit transfusion practice.	Consensus R1 (100:0:0)	Consensus R1 (90:10:0)
f. Blood conservation		
Alternate approaches to anaemia management other than transfusion.	Consensus R1 (90:10:0)	Consensus R2 (90:10:0)
Autologous transfusion options.	Consensus R1 (20:80:0)	Consensus R2 (0:80:20)
Cell salvage.	Consensus R3 (100:0:0)	Consensus R2 (10:80:10)
g. Surgical aspects		
Preoperative, intraoperative and postoperative patient care.	Consensus R1 (90:10:0)	Consensus R3 (100:0:0)
Preoperative anaemia optimisation.	Consensus R1 (100:0:0)	Consensus R1 (80:20:0)
Timing of surgery – When to delay surgery.	Consensus R1 (100:0:0)	Consensus R3 (10:80:10)
Use of tranexamic acid and other antifibrinolytics.	Consensus R1 (90:10:0)	<i>Stability (60:40:0) No change in participant responses</i>

h. Oral iron and IV iron	Doctors	Nurses
Oral iron and IV iron – When to administer what.	Consensus R1 (100:0:0)	Consensus R2 (80:20:0)
How to take oral iron, e.g. dosing and scheduling.	Consensus R1 (100:0:0)	Consensus R1 (90:10:0)
Follow-up of patients on oral iron.	Consensus R1 (100:0:0)	Consensus R1 (90:10:0)
Iron metabolism - role of hepcidin in iron absorption.	Consensus R2 (90:10:0)	Consensus R2 (0:90:10)
IV iron myths - demystify use.	Consensus R1 (100:0:0)	Consensus R1 (80:20:0)
IV iron - dosage and administration.	Consensus R1 (100:0:0)	<i>Stability (60:40:0) (1 participant changed their response)</i>
IV iron – preventing and managing adverse events.	Consensus R1 (100:0:0)	Consensus R2 (80:20:0)
i. Preventing iatrogenic blood loss		
Taking smaller volume samples for laboratory testing (micro-sampling/micro-bleeding).	Consensus R2 (90:10:0)	Consensus R3 (90:10:0)
Avoiding unnecessary repeat testing.	Consensus R1 (90:10:0)	<i>Stability (40:60:0) (1 participant changed their response)</i>
Benefits of Point-of-care testing (POCT).	Consensus R1 (80:20:0)	Consensus R3 (10:90:0)
TEG and ROTEM use and interpretation.	Consensus R2 (80:20:0)	<i>Stability (0:60:40) (1 participant changed their response)</i>
j. Bleeding and blood loss		
Identifying high-risk patients.	Consensus R1 (90:10:0)	Consensus R3 (90:10:0)
Medications, herbs and supplements that increase bleeding risk.	Consensus R2 (90:10:0)	Consensus R2 (80:20:0)
Managing bleeding risk.	Consensus R1 (100:0:0)	Consensus R3 (80:20:0)
Managing patients on anticoagulant/antiplatelet therapy.	Consensus R1 (90:10:0)	Consensus R2 (80:20:0)
Effects of drug interactions.	Consensus R1 (90:10:0)	Consensus R2 (10:90:0)

7.2 Please rate the importance of addressing the following PBM awareness aspects among management and administrative stakeholders such as hospital management, medical aids and finance-related stakeholders			
	Essential	Useful	Unnecessary
Role of management/leadership support in PBM.	Consensus R1 (90:10:0)		
Management and healthcare leadership roles in creating improved health culture.	Consensus R2 (90:10:0)		
Cost-saving benefits associated with PBM.	Consensus R1 (100:0:0)		
Cost comparisons – Blood and blood products versus alternative approaches to treatment of anaemia (haematinics, pharmacological agents).	Consensus R1 (80:10:10)		
Patient care benefits associated with PBM.	Consensus R1 (90:10:0)		
Community healthcare benefits associated with PBM.	Consensus R1 (80:20:0)		
Importance of ensuring availability of haematinics, e.g. iron, B12 and folate.	Consensus R1 (90:10:0)		
Importance of ensuring availability of pharmacological/haemostatic agents.	Consensus R1 (90:10:0)		

8. EDUCATION NEEDS FOR PATIENT EMPOWERMENT			
	Essential	Useful	Unnecessary
8.1 How would you rate the importance of creating a patient-centred culture?	Consensus R1 (80:20:0)		
8.2 Please rate the importance of addressing the following PBM awareness needs among patients	Essential	Useful	Unnecessary
Causes of anaemia.	Consensus R3 (100:0:0)		
Consequences of anaemia.	Consensus R2 (100:0:0)		
Symptoms and signs of anaemia.	Consensus R1 (80:20:0)		
Iron-deficiency anaemia.	Consensus R2 (100:0:0)		
How to take oral iron.	Consensus R1 (80:20:0)		
Dealing with the side effects of oral iron.	Consensus R1 (80:20:0)		
Consequences of anaemia in pregnancy.	Consensus R1 (90:10:0)		
Consequences of anaemia in children.	Consensus R1 (80:20:0)		
Basics of blood testing and blood results.		Consensus R3 (0:100:0)	
Autonomy and patients' rights.	Consensus R1 (90:10:0)		
General health awareness and taking ownership of health.	Consensus R2 (90:10:0)		
Importance of seeking medical guidance from the right people.	Consensus R2 (80:20:0)		
Change the mindset of patients "Doctor always knows best" philosophy,	Consensus R2 (80:20:0)		
Importance of proper informed consent for transfusion.	Consensus R1 (90:10:0)		
Options for patients who refuse blood transfusions.	Consensus R2 (100:0:0)		
8.3 Approaches to educating and empowering patients			
8.3.1 Please rate the value of the following approaches to aid in creating better awareness of anaemia among patients	Essential	Useful	Unnecessary
Information campaigns by healthcare workers/healthcare organisations.	No consensus in Round 1 and Round 2 Stability R3 (30:70:0) (2 participants changed their response)		
Use of radio power.	Consensus R2 (100:0:0)		
Use of social media.	Consensus R3 (100:0:0)		
Make available language-appropriate information booklets for patients.	Consensus R3 (90:10:0)		
Patient education and empowerment talks.		Consensus R3 (10:90:0)	
Asking doctors questions about treatment options.	Consensus R2 (90:10:0)		
Medical aids serving as a voice to educate patients.	Consensus R2 (80:20:0)		

Patients empowering patients with information.	Consensus R3 (80:20:0)		
Digital education app for patients.	No consensus in Round 1 and Round 2 Stability (55:45:0) (1 participant changed their response)		
Videos and posters in waiting rooms (primary, secondary, and tertiary healthcare facilities).	Consensus R3 (90:10:0)		
Community healthcare workers providing education in the respective communities.	Consensus R2 (90:10:0)		
Sharing of patient stories (eventful and uneventful).	No consensus in Round 1 and Round 2 Stability (45:55:0) (1 participant changed their response)		
Online education, e.g. YouTube type videos.		Consensus R3 (10:90:0)	

9. Please rate the importance of addressing the following education failures that impact PBM implementation in hospitals in South Africa			
	Essential	Useful	Unnecessary
Lack of support from hospital management.	Consensus R2 (100:0:0)		
Lack of support for PBM from Heads of Department impacting intern training and practice.	Consensus R1 (80:20:0)		
Linear-type medical education culture where education is mainly knowledge or theoretically focused rather than being practical or application focused.	Consensus R2 (90:10:0)		
Lack of PBM education in undergraduate medical education for doctors.	Consensus R1 (80:20:0)		
Lack of PBM education in undergraduate medical education for nurses.	Consensus R2 (100:0:0)		
Lack of PBM education in postgraduate education for doctors.	Consensus R1 (100:0:0)		
Lack of PBM education in postgraduate education for nurses.	Consensus R1 (90:10:0)		
Lack of education on good clinical transfusion practices in undergraduate medical education.	Consensus R2 (100:0:0)		
Lack of education on good clinical transfusion practices in postgraduate medical education.	Consensus R1 (80:20:0)		
Absence of accredited PBM training programs in South Africa and Africa.	Consensus R1 (80:20:0)		
Locally relevant PBM training content is needed.	Consensus R1 (80:20:0)		
Lack of online self-learning PBM learning programmes for South Africa.	Consensus R2 (80:20:0)		
Lack of training on how to utilise healthcare resources optimally, i.e. practicing in resource constraint settings.	Consensus R2 (80:20:0)		
Interns not attending scheduled PBM-related training sessions.	Consensus R2 (90:10:0)		
PBM training to empower nurses is lacking yet they are the 'ears and eyes of doctors'.	Consensus R3 (100:0:0)		
Philosophical education approaches – therefore not translated in practice.	No consensus in Round 1 and Round 2 Stability (60:20:20) (2 participants changed their response)		
Education of the educators is needed.	Consensus R1 (90:10:0)		
Absence/lack of PBM education initiatives for administrative stakeholders such as medical aids, hospital management and finance stakeholders.	Consensus R1 (90:10:0)		
Pitch education at appropriate levels for the different categories of healthcare professionals.	Consensus R1 (80:10:10)		

Doctors should be taught by doctors, surgeons should be taught by surgeons, nurses be taught by nurses.		Consensus R2 (10:80:10)	

SECTION E: Challenges and barriers to PBM implementation in South Africa and how a PBM toolkit may help with implementation			
This section deals with the need to address existing challenges and barriers that will help enable PBM implementation in hospitals in South Africa.			
10 Please rate the importance of addressing the following barriers and challenges to PBM implementation in South Africa			
10.1 Awareness, education and buy-in	Essential	Useful	Unnecessary
PBM is perceived as overwhelming – it is more work for doctors.		Consensus R3 (20:80:0)	
Lack of PBM knowledge and awareness among healthcare workers across all settings (primary to tertiary healthcare levels).	Consensus R1 (100:0:0)		
Awareness talks and initiatives attract the same individuals who are usually already on board with PBM. Awareness reach is not wide enough to target and get others on board.	Consensus R3 (100:0:0)		
Lack of PBM awareness among General Practitioners; yet GP environment is ideal for early diagnosis and correction of anaemia.	Consensus R2 (100:0:0)		
Nurses are often excluded from PBM awareness initiatives, yet they have a key role to play in PBM.	Consensus R2 (80:20:0)		
PBM awareness in primary healthcare clinics is very poor, yet it is the ideal environment for early detection, correction of anaemia and early referral.	Consensus R1 (90:10:0)		
Community health workers are not educated on PBM; they are ideal partners to educate communities using language and level appropriate for various communities.	Consensus R2 (80:20:0)		
Absence/lack of PBM education during internship training phase of doctors.	Consensus R1 (90:10:0)		
Lack of PBM guidance and support for doctors at all levels in hospitals.		Consensus R3 (20:80:0)	
It should be mandatory for doctors to attend a dedicated education/orientation training on good clinical transfusion practices before they can transfuse patients.	Consensus R1 (90:10:0)		
Limited access to advisory support from Haematologists in the private and public sector.		Consensus R3 (0:100:0)	
PBM has not formally been endorsed by key stakeholders (Department of Health, South African Medical Association, Medical Aids). Uptake is therefore poor.	Consensus R1 (80:20:0)		
Lack of buy-in and support from senior leadership in hierarchical structures within hospitals.	Consensus R2 (100:0:0)		
Some specialties not on board with PBM. If you agree, please comment which...	No consensus in Round 1 and Round 2 Stability (30:60:10) (2 participants changed their response)		
Private hospitals not on board with PBM.	Consensus R1 (100:0:0)		
10.2 Culture of practice among doctors	Essential	Useful	Unnecessary
Longstanding/historic practice of prescribing blood transfusions for treatment of anaemia persists.	Consensus R1 (90:10:0)		
Ego of doctors – making transfusion practice changes difficult.	Consensus R2 (90:10:0)		
Access to blood is easy. It is therefore an overused quick fix to correct anaemia.	Consensus R1 (90:10:0)		
Doctors are overworked, dealing with high patient numbers in public healthcare sector. Transfusion therefore often becomes the quickest and easiest approach to correct low haemoglobin levels in patients.	Consensus R1 (80:10:10)		
Doctors chase numbers when it comes to patients' haemoglobin levels.	Consensus R2 (100:0:0)		

Some consultants leave junior doctors without support with regard to transfusion practice.	Consensus R1 (80:20:0)		
Private healthcare culture – Doctors are not answerable and not open to be told what to do with regard to transfusion practice.	Consensus R1 (90:10:0)		
Focus is still on 'product' rather than 'patient'.	No consensus in Round 1 and Round 2 Stability (70:30:0) (1 participant changed their response)		
Transfusion triggers vary among clinicians within the same discipline.	Consensus R3 (100:0:0)		
Lack of multidisciplinary PBM approach in treating patients with anaemia.	Consensus R1 (80:20:0)		
Single-unit transfusions (transfuse and assess strategy) in non-bleeding patients are not a culture of practice in most settings.	Consensus R2 (80:20:0)		
Lack of surgical capability in district hospitals – Patients have to be referred, causing delay in treatment.	Consensus R2 (90:10:0)		
Understanding of response time required for oral and IV iron to work.	Consensus R2 (80:20:0)		
Access to IV iron in all level hospitals.	Consensus R1 (80:20:0)		
Lack of accountability.	Consensus R2 (90:10:0)		
10.3 Finance-related challenges	Essential	Useful	Unnecessary
Inadequate budget for laboratory screening tests. Anaemia goes undetected in certain patients at primary healthcare facilities and district hospitals, preventing early treatment.	Consensus R3 (90:10:0)		
Silo budgets – Separate laboratory budget, blood budget, pharmaceutical budget, etc., preventing certain good practices due to administrative controls, e.g. spending a little more on the laboratory budget can result in savings on the blood budgets.	Consensus R1 (80:20:0)		
Gatekeeping challenges placing restrictions on ordering of blood tests.	No consensus in Round 1 and Round 2 Stability (30:70:0) (2 participants changed their response)		
Insufficient funds to purchase point-of-care testing devices.	Consensus R3 (80:20:0)		
Inadequate budget to cover costs associated with cell salvage, including the cost of needed consumables.	Consensus R1 (20:80:0)		
TEG – expensive to run tests.		Consensus R2 (10:80:10)	
Not enough budget to employ more hospital staff. Current staff are already overworked with little motivation to do more than they are already doing.	Consensus R3 (90:10:0)		
10.4 Capacity – Manpower challenges	Essential	Useful	Unnecessary
No dedicated person (nurse/doctor) that takes control of PBM in a specific hospital.	Consensus R1 (80:20:0)		
No transfusion practitioners in hospitals.	No consensus in Round 1 and Round 2 Stability (40:50:10) (2 participants changed their response)		
No dedicated PBM nurses in hospitals.	No consensus in Round 1 and Round 2 Stability (60:30:10) (1 participant changed their response)		
Not enough PBM champions.	Consensus R1 (80:20:0)		
No transfusion medicine specialists in hospitals in South Africa.	No consensus in Round 1 and Round 2 Stability (40:30:30) (1 participant changed their response)		

Not enough staff to run preoperative anaemia clinics.	Consensus R3 (100:0:0)		
No time to review blood-accountability forms and monitor blood usage.	No consensus in Round 1 and Round 2 Stability (60:30:10) (1 participant changed their response)		
Backlog of surgical cases – Cannot delay surgery to optimise anaemia in patients.	Consensus R3 (90:10:0)		
Doctors spending time on administrative tasks due to lack of administrative support in public healthcare sector.	No consensus in Round 1 and Round 2 Stability (30:70:0) (1 participant changed their response)		
10.5 Anaemia burden	Essential	Useful	Unnecessary
High anaemia prevalence in South Africa. Patients frequently present with anaemia and 'accepted' as a norm.	Consensus R1 (90:10:0)		
Prioritisation of anaemia in non-surgical patients is poor.	Consensus R1 (80:20:0)		
Anaemia is often underdiagnosed and in some patients it goes undetected.	Consensus R1 (100:0:0)		
Not enough priority is given to treating the causes of anaemia.	Consensus R1 (100:0:0)		
Oral iron, and not blood transfusion should be the first modality for correcting iron deficiency – This is not a common culture of practice, especially in hospitalised patients.	Consensus R2 (90:10:0)		
Oral iron is not always well tolerated by some patients – more tolerable iron preparations come at a higher cost.	Consensus R3 (90:10:0)		
Patients are not educated on how to take oral iron.	Consensus R2 (90:10:0)		
Preoperative anaemia optimisation is not a routine practice in hospitals.	Consensus R1 (90:10:0)		
Oversampling of patients/unnecessary repeat blood tests contribute to anaemia in hospitalised patients.	Consensus R3 (90:10:0)		
Use of smallest size blood collection tube practical for laboratory analysis is not a culture of practice.	Consensus R3 (80:20:0)		
Small size tubes are not always available for use in adult wards.	Consensus R2 (90:10:0)		
Primary healthcare facilities are underresourced for early detection and correction of anaemia (Lack of staff, training, access to laboratory testing, inadequate stocks of oral iron, B12 injections in some facilities).	Consensus R1 (80:20:0)		
District hospitals not adequately geared for anaemia detection and management (Lack of staff, lab testing limitations) – These place burden on tertiary facilities when patients end up complicated.	Consensus R1 (90:10:0)		
Lack of patient-centred healthcare culture.	Consensus R2 (100:0:0)		
Patients not empowered and educated with regard to iron deficiency and the associated consequences.	Consensus R2 (100:0:0)		
10.6 Logistical challenges	Essential	Useful	Unnecessary
Patients not referred early enough to allow for anaemia workup and treatment	Consensus R2 (100:0:0)		
No onsite Pathology laboratory in some public hospitals, causing delays in laboratory testing.		Consensus R3 (0:100:0)	
Delays in receiving laboratory test results in the public sector.		Consensus R3 (0:100:0)	
Delay in anaemia diagnosis often leads to patients' condition having deteriorated by the time they get to tertiary facilities.	Consensus R1 (80:20:0)		
Patients go home before tests results are received, and with no treatment.	Consensus R2 (80:20:0)		
Patients travel long distances to tertiary care facilities.	Consensus R2 (90:10:0)		

Not enough hospital beds to admit patients while awaiting test results for proper diagnosis and treatment.	No consensus in Round 1 and Round 2 Stability (70:30:0) (2 participants changed their response)		
Patients return to healthcare facilities in worse off conditions.	Consensus R3 (80:20:0)		
Some patients never return for treatment / follow-up.	Consensus R3 (90:10:0)		
Hospitals not having onsite blood banks – more blood is ordered as a safety measure to prevent transfusion delays.	No consensus in Round 1 and Round 2 Stability (60:40:0) (1 participant changed their response)		
10.7 Department of Health	Essential	Useful	Unnecessary
Silo culture (independent operations and budget management) of health departments in the various provinces causing regional disparities.	Consensus R1 (80:20:0)		
Lack of national policies/protocols to guide PBM-related practices.	Consensus R1 (90:10:0)		
Primary healthcare facilities not optimally functional/resourced to apply the principles of PBM principles.	Consensus R1 (100:0:0)		
Poverty in society contributes to dietary insufficiencies thus contributing to the anaemia burden.	Consensus R1 (90:10:0)		
Lack of attention given to the clinical significance of anaemia in the South African population.	Consensus R1 (90:10:0)		
10.8 Policy challenges	Essential	Useful	Unnecessary
Not enough policies to guide practices, e.g. anaemia, PBM, transfusion. (Please specify where necessary).		Consensus R2 (20:80:0)	
Lack of national policies, e.g. anaemia, PBM, transfusion (Please specify where necessary).	Consensus R1 (80:20:0)		
Absence of transfusion focus in the National Core Standards for Health Establishments in South Africa.	Consensus R3 (80:20:0)		
Access to policymakers to endorse policies is a challenge.	Consensus R1 (80:20:0)		
Lack of guidelines on creating, changing and reviewing policies.		Consensus R3 (10:90:0)	
Fragmented policies – no standard blood transfusion policy in hospitals.	Consensus R2 (90:10:0)		
Poor/slow implementation of PBM protocols/policies in clinical practice.	Consensus R1 (80:20:0)		
Monitoring of compliance to policies is lacking.	Consensus R1 (80:20:0)		
No specific guidance on PBM in Essential Medicine List guidelines.	Consensus R2 (100:0:0)		
Lengthy guidelines – Simple stronger policies are needed.	Consensus R2 (90:10:0)		
Lack of multidisciplinary collaboration in policy development.	Consensus R3 (100:0:0)		
Challenges getting timeous endorsement of policies by Department of Health at national level.	Consensus R3 (100:0:0)		
Challenges getting timeous endorsement of policies by Department of Health at provincial level.	Consensus R3 (100:0:0)		
Policies, e.g. transfusion, PBM, anaemia, blood conservation should come from the Health Department and not the Blood Services.	Consensus R1 (80:20:0)		
10.9 Infrastructure challenges	Essential	Useful	Unnecessary
Lack of space and infrastructure to set up anaemia clinics.		Consensus R3 (20:80:0)	
Absence of and/or dysfunctional computer systems and IT support for access to laboratory results is poor.	Consensus R3 (90:10:0)		
Absence of electronic blood ordering systems which can create alerts/warnings preventing unnecessary blood ordering.	No consensus in Round 1 and Round 2 Stability (70:30:0) 1 participant changed their response		

Computer systems between hospitals and blood banks are not linked.	<i>No consensus in Round 1 and Round 2 Stability (55:45:0) No change in participant responses</i>		
Lack of emergency medical transport services causes delay in transferring patients with bleeding and blood loss to secondary/tertiary facilities.	Consensus R1 (80:20:0)		
10.10 Lack of general PBM resources/modalities in hospitals	Essential	Useful	Unnecessary
Haematinics in primary healthcare facilities not always available.	Neither consensus nor stability (20:70:10) (3 participants changed their responses)		
Blood warmers not available in most hospitals.		Consensus R3 (0:90:10)	
Lack of cell salvage equipment.		Consensus R2 (20:80:0)	
Consumables for cell salvage devices not available.		Consensus R2 (20:80:0)	
Oral iron not readily available.	Consensus R3 (80:10:10)		
IV Iron not readily available.	Consensus R2 (90:10:0)		
IV Iron access and motivation processes are tedious in the private healthcare sector.	Consensus R1 (80:20:0)		
Lack of comfort with IV iron use.	Consensus R2 (90:10:0)		
Lack of validated devices for point of care testing, e.g. POCT haemoglobin, haematocrit, INR).		Consensus R3 (20:80:0)	
Point-of-care coagulation testing not available in theatres.		Consensus R3 (20:80:0)	
Tranexamic acid not available in some hospitals.	<i>No consensus in Round 1 and Round 2 Stability (55:45:0) 1 participant changed their response</i>		
Erythropoietin not available in some facilities.		Consensus R3 (0:90:10)	
10.11 General challenges	Essential	Useful	Unnecessary
Lack of hospital monitoring systems for blood usage - Dependence on Blood Services for blood usage data.	Consensus R3 (80:20:0)		
No accountability measures for irrational use of blood and blood products including blood wastage.	Consensus R2 (90:10:0)		
Lack of proper informed consent process for transfusion.	Consensus R2 (90:10:0)		
Blood-user committees either non-existent or not adequately functional.	Consensus R3 (100:0:0)		
Time challenges and/or poor commitment from members of blood users' committee/hospital transfusion committee.	Consensus R2 (80:20:0)		
Blood requisition form does not include questions on whether treatment options other than transfusion have been considered for the patient.		Consensus R3 (0:100:0)	
Blood requisition form does not ask for reasons why blood is being ordered for the patient.	Consensus R2 (80:20:0)		
Blood accountability forms are not used in all hospitals when ordering blood and blood products for patients.	Consensus R1 (80:20:0)		

6.5 FINDINGS ON STATEMENTS FOR WHICH CONSENSUS WAS NOT REACHED

After Round Three, there was a total of 93 out of 787 (11.8%) statements for which consensus was not achieved. Stability could be declared for 85 of the 93 statements, yielding 91.4% stability on all **non-consensus** statements. On 20 of the 93 statements, none or zero participants changed their selection; on 42 statements, one participant changed his/her selection, while on 23 statements, two participants changed their selections.

On seven statements, three participants opted for a different choice, and on one statement, four participants changed their selection. For these eight statements (where three or more participants changed their opinions), stability was thus not achieved. There were no statements for which more than four participants changed their opinions.

For these 93 non-consensus statements, it was decided that all the statements for which 50% or more of the Delphi respondents had indicated a point 3 on the Likert scale (indicating that the statement was unnecessary), would be excluded from the framework. This was the case for 12 statements, namely:

- In Table 6, Section C, 4.2 *Policies/protocols/standard operating procedures needed as tools in **primary healthcare facilities***, the following were deemed unnecessary:
 - Intraoperative coagulation assessment,
 - Postoperative assessment of bleeding risk,
 - Point of care coagulation testing,
 - Discipline-specific PBM/transfusion guidelines.
- In Table 6, Section C, 4.5 *Tools for preoperative, intraoperative and postoperative patient care in **primary healthcare facilities***, the following was deemed unnecessary:
 - Blood-sparing surgical techniques,
 - Videos on cell salvage methodology,

- Early postoperative feeding versus upper GI haemorrhage prophylaxis,
 - Anaesthetic blood-conserving strategies,
 - Use of erythropoietin.
- In Table 6, Section C, Point 5. *PBM modalities in primary, secondary, and tertiary healthcare facilities respectively in South Africa*, the following were deemed unnecessary in **primary healthcare facilities**:
 - Erythropoietin,
 - POCT Platelet function.
- In Table 6, Section C, Point 6. *Toolkit look and feel*, the following was deemed unnecessary:
 - There should be separate toolkits for public and private sector hospitals.

Again, it is of interest to note that 11 of the 12 statements listed above for which consensus had not been reached, where 50% or more of the Delphi respondents had selected point 3 (Unnecessary) on the Likert scale; all refer to elements or tools that should be excluded from the framework for a PBM toolkit for **primary healthcare facilities** (PHCs).

In terms of PBM tools and overall PBM needs for PHCs, one participant made the following comment:

My understanding is that primary healthcare centres are expected to manage the greatest patient workload at the most basic level. I therefore think that these staff members should be equipped with simple core PBM knowledge and tools (with an emphasis on Pillar One) to manage common conditions and know when to refer to secondary/tertiary hospitals, rather than be exposed to the wide array of PBM options.

In summary, PBM tools deemed ESSENTIAL and USEFUL were similar for secondary and tertiary level healthcare facilities. A total of 22 statements referring to tools for PHC facilities were deemed UNNECESSARY, and as such they will be excluded from the framework for a PBM toolkit for PHC facilities.

Overall, a high level of consensus (88%) was achieved after the three rounds of the Delphi survey, with the majority (86.8%) selecting option 1 (Essential) and option 2 (Useful) on the Likert scale. Additionally, a high level of stability (91.4%) was achieved on non-consensus statements, meaning a smaller number of participants (two or less participants) changed their stand or opinion on the presented statements.

The overall analysis and results of the Delphi survey informed the development of the framework for a PBM toolkit appropriate for the South African healthcare context.

6.6 RECOMMENDED FRAMEWORK FOR A PBM TOOLKIT FOR THE SOUTH AFRICAN HEALTHCARE CONTEXT

In this study, PBM tools refer to but are not limited to protocols, policies, procedures algorithms, narratives, templates, checklists, posters, fact sheets, talking points, statistics, videos, podcasts, and any other educational or informational material. The recommendations are derived from the results of the literature review, the semi-structured interviews, and the Delphi survey, and are categorised according to the weight given to the statements by the Delphi survey participants. In this framework, recommendations considered ESSENTIAL by 80% or more of the Delphi survey participants are indicated with a tick (✓). Recommendations deemed “USEFUL” by the majority (80% or more), and statements rated less than 80% for any one category, but 80% and more for ESSENTIAL and useful COMBINED, have all been collectively categorised as “*at least useful.*” These statements are presented in *italics*.

In constructing the PBM toolkit framework, the CalSWEC toolkit structure was used as a guiding resource based on its multiple implementation considerations and ability to adapt strategies and interventions to suit various settings.^{234,240} The framework presented as four broad categories of tools is aimed at guiding the development of a toolkit to address several of the reported barriers and challenges to PBM implementation and support the implementation of PBM practices across all levels of hospitals in South Africa.

Table 7 presents the recommended Framework for a PBM toolkit appropriate for the South African Healthcare context

Table 7: Framework for a PBM toolkit appropriate for the South African Healthcare context

1. DEFINITIONAL TOOLS: Contextualizing PBM Aimed at presenting the correct meaning of PBM and framing the importance of its implementation in SA. <i>These are the recommended mandatory or essential tools for a PBM toolkit for all hospitals (primary, secondary and tertiary level) regardless of which PBM intervention/s will be implemented.</i>
1.1 What is PBM and why it should be implemented in hospitals in South Africa?
✓ PBM principles and pillars underpinned by patient-centred care. ✓ Holistic and quality improvement healthcare approach. ✓ Preventative healthcare paradigm. ✓ Multidisciplinary care paradigm. ✓ Improve the health of the nation. ✓ Protects patients' rights and safety. ✓ Improve women's and children's health. ✓ Reduce morbidity & mortality. ✓ Practical approach to address high prevalence of anaemia. ✓ Better vigilance and the right clinical approach to anaemia prevention and treatment. ✓ Replace historic overuse of blood transfusions with research-informed improved clinical practices. ✓ Rational blood use and avoidance or reduction in transfusion adverse effects. ✓ Approach to conserving donor blood which is a scarce resource. ✓ Financial benefits to patients and overall healthcare system. ✓ Wide healthcare reach beyond surgery.
1.2 Value of a PBM toolkit in the implementation of PBM. <i>A PBM toolkit can support and catalyse PBM implementation in hospitals. It can:</i>
✓ Help jumpstart PBM implementation in South Africa. ✓ Align clinical practices to the PBM pillars of PBM and make PBM practically doable. ✓ Enable quality improvement approach to patient care and overall healthcare. ✓ Enable empowerment of healthcare workers by creating better awareness and improved knowledge of PBM. ✓ Encourage clinically appropriate practices and guide the application of best practice standards. ✓ Serve as an educational resource for continuous medical education. ✓ Provide educational support for junior doctors. ✓ Provide quick clinical guidance, particularly in time-constrained settings ✓ Encourage accountability in clinical decision-making. ✓ Replace historic culture of inappropriate transfusion practices with evidence-based practices. ✓ Encourage blood-conserving approaches. ✓ Make PBM implementation possible in South Africa; implementing Pillar 1 is a good starting point and a toolkit can help achieve this.

2. POLICY AND PROCEDURAL TOOLS (To guide and inform evidence-based clinical practices)			
2.1 PATIENT FOCUSED TOOLS (<i>Policies, procedures and protocols for detection and management of anaemia, blood loss and coagulopathy in surgical and non-surgical patients</i>)			
2.1.1 Standard (MUST HAVE) anaemia detection and management tools	Tertiary	Secondary	Primary
PBM checklists for patient history taking.	√	√	√
Anaemia detection algorithms/flowcharts.	√	√	√
Selection of appropriate laboratory tests	√	√	√
Test request algorithm for anaemia. (Include scenarios -when to order what tests?)	√	√	√
Interpretation of laboratory test results - What do elevated/ decreased results mean?	√	√	√
Identifying the underlying causes of anaemia.	√	√	√
Treating underlying causes - anaemia management algorithms with scenarios.	√	√	√
Management of cancer-related anaemia.	√	√	Not necessary
Patient referral (When to refer which patients for further evaluation – gynaecologist, gastroenterologist, haematologist).	√	√	√
Drugs that cause anaemia.	√	√	<i>At least useful</i>
Discipline-specific PBM guidelines.	√	<i>At least useful</i>	Not necessary
Avoiding unnecessary repeat laboratory testing.	√	√	√
Microsampling/microbleeding (smaller volume blood sample collection) benefits.	√	√	<i>At least useful</i>
2.1.1a. Iron deficiency	Tertiary	Secondary	Primary
Serum ferritin screening.	√	√	√
Interpretation of iron studies results.	√	√	√
Prescribing oral iron: How and when.	√	√	√
Prevention and management of side effects of oral iron.	√	√	√
Demystify IV iron myths.	√	√	√
IV iron: Indications, administration, timing, dosage, preventing and managing adverse events.	√	√	√
Monitoring and follow-up of patients on iron therapy.	√	√	√

Digital process to simplify motivation for IV iron to funders.	√	√	Not necessary
2.1.1b. Complete care paradigm for women	Tertiary	Secondary	Primary
Management of patients with heavy menstrual bleeding.	√	√	√
Iron and serum ferritin level monitoring following treatment of anaemia caused by heavy menstrual bleeding.	√	√	√
Management of iron deficiency in pregnancy	√	√	√
Monitoring iron levels 6 weeks postpartum.	√	√	√
Post-operative iron protocol for caesarean section deliveries.	√	√	√
PBM in post-partum haemorrhage and other obstetric bleeding emergencies.	√	√	√
Referral of patients for anaemia workup.	√	√	√
2.1.1c. Management of anaemia in PLWHIV	Tertiary	Secondary	Primary
Simplified anaemia diagnostic approach for PLWHIV.	√	√	√
Risk factors associated with anaemia in HIV infection.	√	√	√
Major causes of HIV-related anaemia.	√	√	√
Drugs that commonly cause myelosuppression in PLWHIV.	√	√	√
Identification and correction of the treatable causes of anaemia in PLWHIV.	√	√	√
Management of anaemia of inflammatory disease (previously termed anaemia of chronic disease).	√	√	√
Vigilance in the treatment of opportunistic infections that can lead to anaemia.	√	√	√
Malignancies that can lead to anaemia.	√	√	√
Current treatment guidelines for anaemia in PLWHIV.	√	√	√
Interpretation of iron studies in PLWHIV.	√	√	√
Use of HAART (Highly Active Antiretroviral Therapy) - impact of various HAART regimens on anaemia.	√	√	√
Anaemia in the HIV population should never be regarded as "normal"- patients who continue to be anaemic after effective ART should be investigated for other causes of the anaemia.	√	√	√
Use of recombinant erythropoietin e.g., erythropoietin alfa.	√	<i>At least useful</i>	<i>At least useful</i>

Considerations for blood transfusion in PLWHIV (30% of patients living with HIV can have a positive Coombs test – associated with crossmatch incompatibilities).	√	√	<i>At least useful</i>
2.1.2 Surgical patients – Tools for pre-operative, intra-operative and post-operative anaemia and bleeding management	Tertiary	Secondary	Primary
Pre-operative screening for anaemia.	√	√	√
Diagnosis and management of anaemia.	√	√	√
Management of iron deficiency in surgical patients (pre-operative, intra-operative and post-operative).	√	√	√
Pre-operative anaemia optimisation.	√	√	√
Pre-operative evaluation for bleeding risk.	√	√	√
Screening patients at high risk for bleeding.	√	√	√
Monitoring patients on anticoagulant/anti-platelet therapy.	√	√	√
Bleeding assessment protocols.	√	√	<i>At least useful</i>
Test request algorithm for bleeding disorders.	√	√	<i>At least useful</i>
Templates/checklists to identify bleeding risk.	√	√	<i>At least useful</i>
Bleeding management protocols.	√	√	√
Management of anticoagulants in the peri-operative period.	√	√	Not necessary
Medications and supplements that cause bleeding.	√	√	√
Bridging coagulation guidelines.	√	√	<i>At least useful</i>
Intra-operative coagulation assessment.	√	√	Not necessary
Post-operative assessment of bleeding risk.	√	√	Not necessary
Massive bleeding (general): Massive haemorrhage protocol.	√	√	√
Management of postpartum haemorrhage.	√	√	√
Management of trauma associated haemorrhage.	√	√	√
Cardiac surgery associated haemorrhage.	√	<i>At least useful</i>	Not necessary
Prescribing pain medication with considerations for bleeding risk e.g., NSAIDS, aspirin, etc.	√	√	√
Point of care coagulation testing and interpretation e.g., TEG, ROTEM.	√	<i>At least useful</i>	Not necessary
How to use point-of-care equipment - Do's and Don'ts.	√	√	√
Limiting dilutional coagulopathy - Guidance on crystalloid use and dangers of overuse.	√	√	√
Minimising iatrogenic blood loss.	√	√	√
Surgical considerations (haemostasis, lowering blood pressure, normothermia).	√	√	Not necessary
Meticulous haemostasis and surgical techniques.	√	√	Not necessary

Blood conservation approaches.	√	√	Not necessary
Blood-sparing surgical techniques.	√	√	Not necessary
Anaesthetic blood conserving strategies.	√	√	Not necessary
Cell salvage protocols – including videos.	√	√	Not necessary
Blood loss formula calculator for predicting blood loss.	√	√	Not necessary
Use of tranexamic acid.	√	√	√
Use of erythropoietin.	√	<i>At least useful</i>	Not necessary
Early postoperative feeding versus upper GI haemorrhage prophylaxis.	√	√	Not necessary
Indications and contra-indications for intraoperative/ postoperative autologous blood collection and re-transfusion.	√	<i>At least useful</i>	Not necessary
Use of autologous blood donation	<i>At least useful</i>	<i>At least useful</i>	Not necessary
Optimize cardiac output.	√	√	<i>At least useful</i>
Optimize ventilation and oxygenation.	√	√	<i>At least useful</i>
Optimize anaemia reserve.	√	√	<i>At least useful</i>
Maximize oxygen delivery.	√	√	<i>At least useful</i>
Minimize oxygen consumption.	√	√	<i>At least useful</i>
Vigilant monitoring and management of post-operative bleeding.	√	√	<i>At least useful</i>
Prevent secondary post-operative haemorrhage.	√	√	<i>At least useful</i>
Avoid/treat infections promptly.	√	√	√
General post-operative patient care guidelines.	√	√	<i>At least useful</i>
2.2 Product-focused tools (Aimed at improving clinical transfusion practices)			
2.2.1 Blood Bank and transfusion-related protocols	Tertiary	Secondary	Primary
Products and services offered by Blood Services.	√	√	√
Clinically appropriate blood ordering and blood usage.	√	√	√
Indications for use of blood and blood products.	√	√	√
Cost of blood and blood products, including surcharges and levies for emergency and out-of-hours testing and services.	√	√	<i>At least useful</i>
Guidelines for blood ordering at hospitals with no onsite blood banks.	√	√	√
Blood management at hospitals with no onsite blood banks.	√	√	√
Transfusion risks and hazards.	√	√	√
Restrictive transfusion thresholds.	√	√	√
Single unit transfusions - transfuse and assess strategy.	√	√	√
Standardized blood accountability forms.	√	√	<i>At least useful</i>

Transfusion control measures to ensure patients are transfused only when clinically necessary.	√	√	√
Motivation for blood transfusion.	√	√	√
Blood ordering form should include questions on whether alternate approaches other than transfusion have been considered for the patient.	√	√	<i>At least useful</i>
Standardised informed consent documents for blood transfusion.	√	√	√
Code of conduct for ordering and administering transfusions.	√	√	√
2.3 PBM Modalities for Tertiary, Secondary and Primary Healthcare Facilities			
	Tertiary	Secondary	Primary
Oral iron	√	√	√
Tranexamic acid	√	√	√
Optimising anaemia before elective surgery.	√	√	√
Point-of-care testing (POCT) Haemoglobin	√	√	√
IV Iron	√	√	<i>At least useful</i>
POCT INR	√	√	<i>At least useful</i>
Erythropoietin	√	<i>At least useful</i>	Not necessary
Cell salvage equipment	√	<i>At least useful</i>	Not necessary
POCT Platelet Function	√	<i>At least useful</i>	Not necessary
POCT intra-operative coagulation monitoring (e.g., ROTEM or TEG)	√	<i>At least useful</i>	Not necessary
POCT Haematocrit	<i>At least useful</i>	<i>At least useful</i>	Not necessary
Intra-operative normovolaemic haemodilution	<i>At least useful</i>	<i>At least useful</i>	Not necessary
3. EDUCATION AND TRAINING TOOLS (<i>Directed at bridging PBM educational gaps amongst doctors, nurses, healthcare leadership stakeholders and patients</i>)			
3.1 Educational Needs: Doctors and Nurses			
3.1a. General aspects of PBM	Doctors	Nurses	
PBM definition and benefits of PBM.	√	√	
PBM Pillars – What do they mean practically and how to apply them.	√	√	
Multidisciplinary care paradigm.	√	√	
Management and optimal use of resources in resource constraint healthcare settings.	√	√	
Role of nurses in PBM and nurse empowerment.	√	√	
Knowledge of haemostasis.	√	<i>At least useful</i>	
Role of the laboratory in PBM.	√	<i>At least useful</i>	

3.1b. Anaemia work up and diagnosis	Doctors	Nurses
Anaemia is treatable.	√	√
Approaches to early diagnosis and treatment.	√	√
Medications that cause anaemia.	√	√
Consequences of anaemia.	√	√
Consequences of iron deficiency anaemia on women and children.	√	√
Managing obstetric emergencies	√	√
Management of HIV-related anaemia	√	√
When to order what laboratory tests.	√	<i>At least useful</i>
Interpretation of laboratory test results.	√	<i>At least useful</i>
3.1c. Blood Banking		
Blood and blood products and their indications.	√	√
Blood transfusion is not the first choice treatment for anaemia.	√	√
Cost of blood and blood products.	√	√
Blood wastage – Implications for Blood Services and Clinical Services.	√	√
Benefits of ordering blood on a returnable basis.	√	√
Appropriate storage of blood and blood products.	√	√
Appropriate use of blood and blood products.	√	√
Difference between PBM and blood conservation.	√	√
Blood ordering – When to order what products.	√	<i>At least useful</i>
Cost of testing (various crossmatch types) including out-of-hours levies/surcharges.	√	<i>At least useful</i>
3.1d. Ethical aspects		
Ethical imperative for PBM.	√	√
Ethical aspects of the use of blood and blood products.	√	√
Process for informed consent.	√	√
Doing enough and what is best for patients – patient specific considerations.	√	√
Autonomy and patients' rights.	√	√
Medico-legal implications of inappropriate anaemia management.	√	√
Medico-legal implications of inappropriate blood transfusions.	√	√
Providing clinically appropriate patient advice.	√	√
Patient education and empowerment.	√	√
3.1e. Clinical Aspects		
Clinically appropriate transfusion decision-making (Moving away from knee-jerk reactions to an informed approach).	√	√
Transfusion risks and hazards.	√	√
Restrictive transfusion thresholds.	√	√
Adequate assessment of patients - Proper history taking.	√	√
Transfusion administration and monitoring.	√	√
Four-hour rule (transfusion should not exceed four hours)	√	√
Early patient referrals.	√	√
Single unit transfusion practice.	√	√

3.1f. Oral iron and IV iron	Doctors	Nurses
Oral iron and IV iron – When to administer what.	√	√
How to administer (dosing and scheduling) and advise patients.	√	√
Iron metabolism - role of hepcidin in iron absorption.	√	√
IV iron myths - demystify use.	√	√
IV iron - Dosage and administration.	√	<i>At least useful</i>
IV iron – Preventing and managing adverse events.	√	√
Follow up of patients on iron therapy.	√	√
3.1g. Preventing iatrogenic blood loss.		
Smaller volume samples for laboratory testing (micro-sampling/micro-bleeding).	√	√
Avoiding unnecessary repeat testing	√	<i>At least useful</i>
Point-of-care testing (POCT)	√	<i>At least useful</i>
TEG and ROTEM use and interpretation	√	Not necessary
3.1h. Surgical aspects		
Pre-operative anaemia optimisation.	√	√
Pre-operative, intra-operative and post-operative considerations.	√	√
Timing of surgery	√	<i>At least useful</i>
Use of tranexamic acid and other antifibrinolytics.	√	<i>At least useful</i>
3.1i. Blood conservation		
Alternate approaches to anaemia management other than transfusion.	√	√
Cell salvage.	√	<i>At least useful</i>
Autologous transfusion options.	<i>At least useful</i>	<i>At least useful</i>
3.1j. Bleeding and blood loss		
Identifying high-risk patients.	√	√
Medications, herbs and supplements that increase bleeding risk.	√	√
Managing bleeding risk.	√	√
Managing patients on anticoagulant/anti-platelet therapy.	√	√
Effects of drug interactions.	√	<i>At least useful</i>

3.2 Educational Needs: Healthcare leadership, management and administrative stakeholders (government, hospital leadership, budget decision makers, medical aids, and other non-clinical stakeholders)
✓ Role of management/leadership in PBM. ✓ Financial outcomes – cost-saving benefits. ✓ Healthcare imperatives of PBM ✓ Cost comparisons – Blood and blood products versus alternative approaches to treating anaemia(haematinics, pharmacological agents). ✓ Anaemia is treatable. ✓ Importance of ensuring availability of haematinics. ✓ Importance of ensuring availability of pharmacological/haemostatic agents ✓ Benefit to patients, communities and overall healthcare. ✓ Creating and sustaining an improved health culture with PBM.
3.3 Educational Needs: Patients
✓ Basics of anaemia and iron deficiency. ✓ How to look out for anaemia. ✓ How to take oral iron. ✓ Consequences of anaemia especially women and children. ✓ Basics of blood testing and blood results. ✓ Autonomy and patients' rights. ✓ General health awareness and ownership of health. ✓ Importance of seeking guidance from the right people. ✓ Change mindset “Doctor always knows best.” ✓ Risks of transfusion. ✓ Informed consent. ✓ Alternative treatment options for anaemia other than transfusion. ✓ Options for patients who refuse transfusions.
3.4 Approaches to Educating Patients
✓ Education and empowerment talks, seminars, etc. by healthcare providers. ✓ Radio broadcasts. ✓ Social media platforms. ✓ Language-appropriate information booklets. ✓ Doctors providing information and education. ✓ Educational material from medical aids /health insurance funders. ✓ Patients empowering patients through shared knowledge and experience. ➤ <i>Videos and posters in hospital/clinic waiting rooms.</i> ➤ <i>Community healthcare workers educate communities.</i> ➤ <i>Online education e.g., YouTube type videos.</i> ➤ <i>Information campaigns hosted by healthcare workers/healthcare organizations.</i> ➤ <i>Digital education app for patients.</i>

4. Assessment, Planning and Evaluation tools

Aimed at helping assess readiness for PBM, identify hospital-specific needs, and plan the implementation of PBM interventions in the respective hospitals

4.1 Planning and Assessment Tools	Tertiary	Secondary	Primary
Self-audit guidelines and checklists.	√	√	√
Needs analysis - PBM readiness checklists to assess implementation readiness; identify gaps that need to be addressed.	√	√	<i>At least useful</i>
Guidelines for setting up hospital-appropriate PBM interventions/ programme.	√	√	√
Easy access templates for hospitals to write their PBM-related protocols.	√	√	√
How to implement policies and procedures.	√	<i>At least useful</i>	<i>At least useful</i>
How to set up pre-operative anaemia and bleeding clinics.	√	√	√
How to set up hospital transfusion committee/blood user committee/PBM committee.	√	√	<i>At least useful</i>
Committee representation guidelines for hospital transfusion committee/blood user committee/PBM committee.	<i>At least useful</i>	<i>At least useful</i>	<i>At least useful</i>
Standing meeting agenda templates for hospital transfusion committee/blood user committee/PBM committee meetings.	√	<i>At least useful</i>	<i>At least useful</i>
4.2 Evaluation Tools			
Audit tools (How to carry out an audit e.g., transfusion use, iron reactions, etc.)	√	√	Not necessary
Setting metrics/targets – measures to see if PBM targets are being met.	√	√	<i>At least useful</i>
Evaluating metrics/targets to measure outcomes.	√	√	<i>At least useful</i>
Implementation of electronic blood ordering systems.	<i>At least useful</i>	<i>At least useful</i>	Not necessary
4.2.1 Audit and Monitoring of Blood and Blood Product Usage in Hospitals			
✓ Mandatory monitoring and auditing of blood and blood product usage are necessary surveillance, vigilance, and accountability strategies. It is also a means to evaluate the outcomes of PBM education and practice improvement interventions. This should be done by: ✓ Hospital management ✓ Blood users committee/PBM committee/hospital transfusion committee ✓ Heads of each department ✓ Transfusion practitioner/PBM nurse appointed for the hospital (Ideal) ✓ Blood Services ➤ <i>Hospital-appointed transfusion/PBM nurse</i> ➤ <i>Department of Health</i>			

6.7 CONCLUSION

This chapter presented the results and overall findings of the Delphi survey. The relatively high degree of consensus and stability, coupled with a very low number of statements considered 'unnecessary' in a diverse group of participants, and a 100% response rate in all three rounds of the survey collectively support the validity of the results that ultimately informed the PBM toolkit framework for the South African healthcare context. Chapter 7 is devoted to the discussion of the PBM toolkit framework as the outcome of this study.

CHAPTER 7: A FRAMEWORK FOR A PATIENT BLOOD MANAGEMENT TOOLKIT APPROPRIATE FOR THE SOUTH AFRICAN HEALTHCARE CONTEXT

7.1 INTRODUCTION

The WHO-endorsed principles of PBM are increasingly being formalised and adopted in hospitals worldwide, particularly in HICs. Uptake remains slow in LMICs, and many countries, including SA, seek guidance and support. The previous chapter presented the results of the Delphi survey that informed the development of the framework for a PBM toolkit relevant to the South African healthcare context.

In this chapter, the PBM toolkit framework will be discussed with reference to the four broad categories of tools aimed to guide the planning, implementation, and maintaining a culture of PBM practices in SA. The value of a PBM toolkit in addressing some of the barriers and challenges to PBM is outlined. The chapter concludes with opportunities to consider for steering PBM implementation in South African hospitals.

7.2 THE NEED FOR PATIENT BLOOD MANAGEMENT IMPLEMENTATION IN SOUTH AFRICA

There was consensus in this study that the public sector hospitals in the country are burdened with high patient numbers and face human resource, capacity, and resource challenges. These challenges negatively impact the quality and efficiency of healthcare delivery. Participants expressed that the prevalence of anaemia and its associated complications is much higher in the public patient population group due to high levels of poverty and the overall socio-economic imbalances in the country. This contributes to increased health resource demands and utilisation in an already constrained public health environment. Participants felt that this alone provided a strong rationale for the adoption of PBM as a health improvement and cost-saving strategy not only in public sector hospitals but all hospitals.

However, 14 years post-endorsement of PBM by the WHO in 2010, implementation remains in its infancy in SA and other LMICs. Although PBM champions in this study described some PBM implementation and education initiatives taking place to some extent in certain hospitals, PBM awareness and uptake more broadly in SA remains inadequate. It is important to note that the PBM champions interviewed in this study had many years (15–40 years) of experience as healthcare practitioners; however, they only had 3–5 years involvement with PBM. This serves as testimony that PBM is still an emerging concept in SA; hence, guiding tools are needed, particularly in light of the reported barriers and challenges that impede implementation.

7.3 BARRIERS TO PATIENT BLOOD MANAGEMENT IMPLEMENTATION IN SOUTH AFRICA

The major barriers reported in this study that warrant urgent attention and correction are summarised as follows:

- Lack of PBM knowledge and awareness among doctors and other key stakeholders.
- Lack of importance given to the correct management of anaemia, and ID.
- Lack of standardised policies and protocols to guide evidence-based practices (EBPs).
- Overuse of blood transfusions in treating anaemia and bleeding.
- Insufficient vigilance and accountability with regard to inappropriate transfusion practices.
- General resource challenges.

These barriers are not unique to SA. Several countries, both HICs and LMICs, have reported similar stumbling blocks that required tailored strategies to overcome them.^{41,42,52,54,131}

There was, however, consensus that despite existing barriers, clinicians should not ignore or withhold a healthcare model beneficial to vulnerable populations in the country, blood donors included.

The results of this study call for doctors, along with nurses, hospital leadership, and other essential role-players, to take the lead in establishing PBM programmes at all levels of hospitals in SA.

7.4 VALUE OF A PATIENT BLOOD MANAGEMENT TOOLKIT

Implementing EBPs such as PBM in real-world clinical settings can become challenging and even futile if effective strategies, guiding measures, and support tools are not applied. Participants expressed confidence that PBM is possible in SA and that a toolkit comprising implementation guidelines, and educational and clinical practice resources would make PBM practically doable, one pillar at a time, if necessary. A toolkit of adaptable resources can inform, facilitate, and increase the uptake and adoption of best practices.

There was consensus that a PBM toolkit tailored to the various disciplines of medical practice and various healthcare settings – private and public, primary, secondary, and tertiary levels – can empower and enable healthcare workers to do what is right and best for patients. It would serve as a catalyst, helping clinicians “know what to do” and practically “do what they know” in the clinical environment.

7.5 PATIENT BLOOD MANAGEMENT TOOLKIT FRAMEWORK

It is important to note that this study was not aimed at developing a PBM toolkit itself. The PBM toolkit framework presented as the outcome of this study serves as a comprehensive ‘go-to’ resource to guide implementers of PBM in planning and implementing one or more PBM interventions. The framework serves as a point of reference for selecting the appropriate mix of tools, taking into consideration the local and individual needs of hospitals, and packaging them into a fit-for-purpose toolkit that can be easily accessed and practically applied in practice.

In creating the framework, the researcher used the collective recommendations that emerged from the literature (Chapters 2 and 3), the interviews (Chapter 5), and the Delphi survey (Chapter 6), to map what is needed to guide implementation and support clinicians in adopting PBM into daily practices.

At a glance, the PBM toolkit framework presented in this study appears complex and multifaceted. However, a closer look reveals a simplified four-category catalogue of fundamental resources to guide the implementation of PBM interventions in an adaptable, phased, or stepwise approach. The CalSWECC toolkit structure, recognised for its multiple implementation considerations and adaptability was used as a guiding resource to construct the PBM toolkit framework.^{234,240}

The four broad categories of tools that make up the PBM toolkit framework include:

- (i) **Assessment, planning, and evaluation tools** to assist hospitals in planning, and implementing PBM interventions.
- (ii) **Definitional tools** to contextualise PBM and frame the importance of its implementation in SA.
- (iii) **Policies and procedural tools** to guide and inform evidence-based clinical practices.
- (iv) **Education and training tools** directed at bridging PBM educational gaps among doctors, nurses, healthcare leadership stakeholders, and patients.

7.6 APPLICATION OF THE TOOLKIT FRAMEWORK IN PATIENT BLOOD MANAGEMENT IMPLEMENTATION

Implementation of any intervention, first and foremost, requires contextualisation of the problem or gap that initiated its need, and why and to whom the problem is important. At the outset, the problem or gaps must be explicitly understood together with the immediate and long-term consequences of not correcting them. This is important in planning what corrective measures need to be implemented to address the gaps.

7.6.1 Assessment and planning tools

In developing a PBM implementation strategy, an important starting point is for those involved in the planning to take the time to assess readiness, resource availability, existing challenges or limitations, and the particular needs of their respective health facilities. Pre-assessment is, therefore, an important primary step that should be undertaken within individual hospitals or a cluster of similar hospitals to determine which PBM interventions should be prioritised.

Such an assessment can be facilitated using the assessment and planning tools. Self-audit guidelines and checklists were recommended to assess the readiness of hospitals. Guided by a needs analysis template of what needs to be done, when, and by whom, hospitals can map the immediate and long-term interventions and the overall PBM implementation strategy. Meybohm *et al.* share a comprehensive checklist comprising 107 PBM measures grouped as bundles to facilitate PBM implementation.³⁶ This checklist can be tailored into an appropriate assessment tool for the South African healthcare context by simple modifications that include PBM gaps, opportunities, and what is doable in specific hospitals.

Basic examples of practical, feasible, and cost-effective start-up interventions recommended in this study include: the implementation of clear, standardised procedures for diagnosis and treatment of the common causes of anaemia (ID in particular), demystifying myths and increasing the use of IV iron in the treatment of ID, use of antifibrinolytics such as tranexamic acid in surgical and nonsurgical patients, single-unit transfusion practices, and the mandatory use of blood-accountability forms for blood ordering. Such start-up interventions do not require high-cost infrastructure and resources. They can be successfully implemented in any healthcare setting with careful planning, supported by education, training, guiding policies and procedures, and having available the required diagnostic and treatment modalities.

Participants cautioned against implementing multiple interventions all at once. This may result in PBM being perceived as complex and overwhelming, potentially leading to poor uptake and outcomes. Priority should be given to the most needed intervention/s for particular hospitals or even department/s within hospitals, based on the outcomes of the needs assessment and the readiness status of hospitals. All efforts should be directed toward achieving the desired outcomes of a particular intervention.

7.6.2 Definitional tools

In steering the implementation, participants emphasised the importance of getting clinicians on board early in the process. PBM should not be framed as a 'rule or an ultimatum' imposed on them. Clinicians should be formally educated on the concept of PBM, introduced to the correct definition and meaning, and sensitised to why it is an urgent and important need in SA and elsewhere.

In this study, a host of factors grouped and presented as definitional tools aim to contextualise PBM by providing the correct meaning and making explicit the patient and overall healthcare benefits associated with PBM implementation. Definitional tools ideally include narratives, fact sheets, talking points, statistics, and other valuable information that show why an intervention or programme is important and necessary for improving healthcare practices.²⁴⁰ The definitional tools outlined in the toolkit framework were informed by the participants' unanimous support for PBM as a holistic, wide-reaching quality improvement, patient-focused healthcare strategy that can improve the health status of the South African population.

PBM was seen as an opportunity to ease the anaemia burden in the country, and in doing so, reduce anaemia-associated complications in patients of all age groups. It was supported as a high-ranking solution to correct deep-rooted, non-evidence-based practices such as the inappropriate use of blood transfusions as a routine treatment modality for anaemia and blood

loss. Additionally, participants felt it necessary to draw the attention of clinicians to the global and local economic, social, and health consequences of anaemia, the detrimental outcomes of inappropriate diagnostic workup and poor management of anaemia and ID, including the multiple harms, adverse outcomes, and high costs associated with blood transfusions.

The views expressed by the participants align with the literature supporting the global need for PBM.^{5,23,41,42,52,131,163,224} Appropriately tailored policies and procedures coupled with education and training were advocated to grow PBM awareness and develop readiness for evidence-informed practice changes.

7.6.3 Policy and procedural tools

Policies, SOPs, and protocols provide the rules and instructions for practice. When compiled with the end in mind (what must be achieved), planned interventions can yield successful outcomes. Well-defined policies and procedures aim to ensure consistency in practices; they can mitigate risks for both patients and health practitioners, and they serve as an effective internal control system for adherence to regulations and standards.²⁴⁰ The WHO claims that the best health policies are those based on scientific evidence; their mandate is to get the evidence right and ensure that it is properly used to make the world a healthier place.³³³

In this study, a host of policies, procedures, protocols, guiding algorithms, flowcharts, videos, and apps were recommended to guide evidence-based PBM practices in primary, secondary, and tertiary-level hospitals in SA. These were grouped into two broad categories:

- **Patient-focused tools**, referring to PBM modalities and policies, procedures, and protocols to guide the diagnostic workup and appropriate management of anaemia, blood loss, and coagulopathy in surgical and non-surgical patients.
- **Product-focused tools**, referring to blood bank and transfusion-related policies and procedures to improve transfusion vigilance and clinical decision-making.

7.6.3.1 Patient-focused tools

7.6.3.1.1 Diagnostic workup and management of anaemia (all patient groups)

Implementing PBM pillar one was deemed the highest priority. Having clearly defined anaemia screening, diagnostic, and management protocols for the various categories of patients (medical, surgical, obstetric) as standard tools across all levels of healthcare can improve care delivery and patient outcomes. Participants agreed that this should be the primary target for all hospitals.

Although policies and SOPs are important, they can be lengthy to read and conceptualise. Algorithms were suggested as more efficient, quick-guidance reference tools. Such tools can improve efficiency in clinical decision-making and help clinicians take the right steps to correctly diagnose patients and provide the right care at the right time. Linking case scenarios to algorithms was suggested as an additional support tool for clearer guidance.

PHC facilities, including private GP practices, were considered the ideal environment for early detection and correction of anaemia. Even though these facilities are often not adequately resourced or equipped to provide certain treatments such as IV iron infusions, once correctly diagnosed, patients could be informed of their health status and referred early enough to secondary or tertiary-level facilities for appropriate management. It was highlighted that patients who receive tertiary-level care ultimately return to their respective PHC facilities for follow-up monitoring and maintenance of care. Guiding procedures to adequately support PHC clinicians in managing anaemia are therefore essential.

Participants reported a high prevalence of anaemia among surgical and non-surgical patients in hospitals and clinics across the country. This reporting aligns with the literature on the high global prevalence of anaemia, particularly in LMICs.^{80,100,334,335} Concerns were expressed that the common occurrence of anaemia among the South African patient population contributes to the condition being perceived as a norm. As a result, anaemia is generally poorly prioritised,

accompanied by a degree of complacency in its management. It goes underdiagnosed or undetected, resulting in patients being under-treated or not treated at all. Similar concerns have been raised in other healthcare settings.^{17,101,248}

Failure to correctly diagnose patients, administer the right treatment, or refer patients at the right time represents failure of care delivery. It has been suggested that insufficiently managed anaemia may be the world's biggest failure to deliver care, as insufficient or unmanaged anaemia, blood loss, and/or coagulopathy have unintended consequences contributing to adverse outcomes, suboptimal safety, and quality of patient care.¹³³ This brings with it significantly higher overall healthcare expenditures and resource consumption.¹³³

In the South African context, poorly managed anaemia and/or delays in treatment contribute to patients becoming complicated, usually requiring tertiary-level care. Participants claimed that the lack of early care delivery magnifies the already overburdened, overstretched, and limited number of tertiary-level care facilities in the country. This could be avoided by instituting clear diagnostic, early treatment, and referral protocols for anaemia and ID at PHC facilities.

7.6.3.1.1a. Iron deficiency

It is well established that ID is the most common cause of anaemia, particularly in LMICs.^{71,80,262}

It was therefore indicated that in countries like SA, a full blood count or Hb testing alone is not adequate, as patients with normal Hb results could very well be iron-deficient. Patient history, symptoms, and other lifestyle factors must alert clinicians to additionally screen for at least ferritin levels, as a minimum, to diagnose ID. Detailed history-taking templates or checklists to capture comprehensive patient information were advocated as standard tools for patient screening.

Protocols and algorithms guiding baseline laboratory screening, including when, why, and for which patients additional testing may be needed, were deemed essential. Clear guidelines for the

interpretation and understanding of laboratory test results, combined with patients' history, are foundational pillars in obtaining a reliable diagnosis through which appropriate patient management regimens can be applied.

7.6.3.1.1b. Women's health

The common presentation of ID among women of all ages in SA warranted procedural tools targeting a complete care paradigm for preventing, diagnosing and managing anaemia and ID in this vulnerable patient group. Appropriate management of HMB, including checking ferritin levels following treatment, was deemed mandatory. Identification of the causes of HMB informs the creation of a menu of appropriate medical and procedural interventions for affected women.¹⁰¹ In light of HMB being one of the main causes of ID in women of reproductive age, its management should be prioritised, starting at the PHC level.

Efficient management of ID in obstetric patients, not only in the prenatal phase but also six weeks postpartum, was advocated. Furthermore, the high maternal mortality rate in LMICs, including SA, coupled with the high demand for blood, warrants protocols not only for the prevention and management of PPH but also for the early diagnosis and optimal management of prenatal and postnatal anaemia. The well-recognised adverse effects of anaemia and ID in women and children argue for the correction of iron levels and normalisation of iron stores not only in pregnant women but also in women planning to conceive.

These recommendations offer a practical solution to addressing anaemia and ID early in pregnancy, avoiding patients being anaemic at delivery and not having the margin of reserves to protect them should massive bleeding occur.³⁸ This could reduce the need for blood transfusions, reduce the maternal death rate in the country, and improve foetal and maternal health.

Implementing such PBM initiatives will feed into and support the South African DoH's efforts toward the Sustainable Development Goal of reducing maternal mortality to below 70 per 100 000

live births and neonatal mortality to 12 deaths per 1 000 live births.²⁰⁵ Protocols and clinical care pathways for the appropriate and efficient management of anaemia and ID in women of reproductive age must be an immediate priority across all healthcare settings.

Additionally, referral protocols for specialist investigation to the gastroenterologist, gynaecologist, and haematologist respectively, were deemed essential, not only for female patients but all patients. Discipline-specific diagnostic and treatment guidelines are needed for specialist-level and tertiary care facilities. The importance of providing efficient, minimal-risk treatment was strongly supported.

7.6.3.1.1c. Oral iron

There was consensus that, for most cases, oral iron therapy and not blood transfusions should be the first-line treatment for ID with or without anaemia. The gastrointestinal side effects associated with oral iron, and hepcidin-associated reduced absorption of iron caused by inappropriate or high dosing of iron, call for protocols to guide doctors and nurses on how to prescribe oral iron, including when and for which patients. Participants agreed that treating practitioners have an obligation to monitor patients on oral iron. This will guide whether oral iron treatment should continue or be replaced with IV iron.

7.6.3.1.1d. Intravenous iron

The use of IV iron for the efficient treatment of ID, particularly in patients not responding to oral iron treatment, was well supported across all levels of care. It emerged that IV iron was more readily available in public hospitals than in private hospitals; however, the general overall use of IV iron across all sectors was poor. Limited usage of IV iron was mainly attributed to access challenges (more so in the private sector).

Myths surrounding IV iron were reported as a deterrent to its use across both sectors. Educational material supported by scientific evidence was recommended to help demystify misconceptions

and create awareness that IV iron is far safer than blood transfusions, and overall, a more efficient and cost-effective treatment modality.

The existing access issues with IV iron in the private sector were a common concern. Participants explained that private sector doctors are required to submit individual patient motivations to medical insurers for the use of IV iron. This presents the following challenges:

- It is an administrative inconvenience.
- Turnaround times for feedback from insurers can take up to 48 hours or even longer, especially over weekends and on public holidays.
- Motivations are often rejected if patients do not meet the insurer's internal and often unknown criteria for IV iron.
- If not approved by their insurer, patients must incur the costs of IV iron therapy.

As a result, blood transfusions become a more accessible, convenient means to correct anaemia. It was therefore recommended that, in addition to having guiding procedures and protocols for the indications, administration, and monitoring of IV iron infusions, the toolkit should ideally include digital documents or digital processes – preferably an app – to simplify the IV iron motivation submission to insurers.

7.6.3.1.2. Anaemia in patients living with HIV

In light of the high prevalence of HIV in SSA, coupled with anaemia being the most frequent haematologic abnormality among PLWHIV, specific procedures and protocols for the diagnosis and management of HIV-related anaemia across all healthcare levels were advocated.

The early diagnosis and prompt management of anaemia in the setting of HIV is not only important to improve clinical outcomes and quality of life but can also play an important role in reducing health resource utilisation.¹⁹⁵

Although the prevalence of severe anaemia has decreased since the introduction of cART, mild-to-moderate anaemia continues to be common.³³⁶ A simplified diagnostic approach and correction of the treatable causes of anaemia, including guidance on risk factors, managing opportunistic infections, and the impact of various cART regimens on anaemia, are essential. It must be noted that patients with uncontrolled HIV or acquired immune deficiency syndrome (AIDS) causing uncontrolled anaemia, may not respond to typical PBM measures such as nutritional supplementation. Anaemia in these patients remains a challenge to treat, requiring added health resource utilisation until effective antiretroviral treatment (ART) is instituted. Alleviating anaemia in PLWHIV mandates the earlier and more effective adoption of ART.

Furthermore, evidence on blood utilisation in SA suggests that blood product usage is positively associated with HIV prevalence.¹⁹⁵ Decisions to transfuse PLWHIV warrant careful consideration, based on the fact that some (up to one-third) of HIV-positive patients are known to present with a positive direct antiglobulin test (DAT) or Coombs' test, either due to autoimmune haematolytic anaemia or other causes.^{337,338} Finding suitably matched blood for such patients is often a challenge.^{339,340}

As the researcher, having worked in the blood banks for several years, I have directly experienced the crossmatch difficulties encountered not only with HIV patients presenting with a positive DAT, but any patient presenting with a positive DAT. These patients often end up being transfused with crossmatched incompatible blood, which magnifies the risk for transfusion-associated adverse outcomes. Early diagnosis and prompt management of anaemia in PLWHIV is not only important to improve clinical outcomes and quality of life, but can play an important role in reducing health resource utilisation; however, this requires a good understanding of the pathophysiology of anaemia in HIV.¹⁹⁵

As standard practice, blood transfusions should be a last resort treatment when there are no other suitable alternatives. In the broader context, it is imperative to explore anaemia treatment regimens that avoid the use of blood transfusions, not only for PLWHIV, but for all patients, as the principles of transfusion medicine do not and should not differ between HIV-negative and HIV-positive patients.¹⁹⁰

7.6.3.1.3. Tools for the surgical setting

There was consensus among participants that preoperative anaemia is common in the South African surgical patient population. This contributes to high perioperative blood usage. The South African Surgical Outcomes study reported by Marsicano *et al.* validates this.⁹²

7.6.3.1.3a. Preoperative anaemia

In this study, preoperative anaemia optimisation was rated as a neglected or non-existent practice across both the public and private sectors. Research shows that anaemia is associated with increased perioperative blood transfusions, a practice independently associated with increased morbidity and mortality.^{92,94,96,341,342} Despite this, decisions to transfuse are taken with little or no clinical judgment.

As outlined in Chapter 2, the practice of bloodless medicine and surgery pioneered by Dr Denton Cooley, who performed cardiac surgery on patients who refused blood transfusions, bears testimony that transfusions can be avoided in surgical patients. Dr Cooley and his team proved this doable by integrating and applying the best research evidence with clinical expertise while prioritising patient values and preferences.^{62,63}

Participants agreed that the principles of care applied to patients who refuse blood transfusions (such as Jehovah's Witness patients) should be standard principles of care for all patients.

Standardised protocols and procedures outlining the approach to preoperative anaemia optimisation were deemed high priority. Better preoperative planning can reduce or avoid perioperative allogeneic transfusions and improve the outcomes of surgical patients.^{52,343,344}

7.6.3.1.3b. Preoperative planning

It was noted that in the public healthcare sector in SA, unless in cases of emergency, patients are almost always placed on a waiting list for surgical procedures, including cardiac surgery. Participants felt that this waiting period, which ranges from approximately six months to more than a year, could provide an ideal window for the correction of preoperative anaemia using nutritional and pharmacological modalities. The surgical waiting period could also be used to perform adequate laboratory screening, not only for anaemia and ID but also for coagulation disorders.

Screening patients on coagulation therapy and those potentially at risk for bleeding for platelet count and coagulation tests (prothrombin time (PT), international normalised ratio (INR), and activated partial thromboplastin time (APTT)) was deemed appropriate. In doing so, the underlying cause/s of anaemia and blood loss can be identified and corrected prior to surgery, thus preventing, if not significantly reducing, unnecessary transfusions and perioperative morbidity. Guiding tools for setting up preoperative anaemia and bleeding clinics were advocated.

7.6.3.1.3c. Basic patient blood management modalities

Availability and the use of basic, cost-effective haematinics and nutritional supplements such as iron, vitamin B12, and folic acid for optimising patients' anaemia were deemed essential across all levels of healthcare. In patients with ID, simple measures, such as using iron replacement therapy to optimise red cell mass preoperatively, are a sensible first step regardless of the healthcare setting. These non-transfusion modalities, individually and collectively, are critically important and appropriate everywhere, but especially in LMICs and rural settings with limited access to blood and blood services.³⁸

It was also recommended that erythropoiesis-stimulating agents be made available at least in tertiary-level hospitals for adult renal patients and other patients with appropriate clinical indications undergoing elective surgery. Pre-operative administration of erythropoietin has been shown to improve outcomes and reduce the requirement for allogeneic blood transfusions in patients undergoing elective surgical procedures.^{345,346} Despite its potential, concerns exist regarding erythropoietin safety.^{347,348} As with the use of any therapeutic intervention, erythropoietin should be used in clinically appropriate circumstances.

7.6.3.1.3d. Limiting blood loss

In addition to protocols for preoperative anaemia optimisation, guidelines for minimising bleeding and blood loss by considering patient-specific blood conservation techniques were deemed essential for health facilities that perform surgery, i.e. mainly secondary and tertiary hospitals in SA. Procedures outlining blood preservation techniques, such as cell salvage, anaesthetic blood-conserving strategies, meticulous haemostasis, surgical considerations and techniques that limit blood loss, were deemed essential, particularly in tertiary care facilities, as these are sites for major surgery.

There is evidence that spinal anaesthesia may reduce blood loss and conventional suction drains should be avoided because these may increase blood loss.²⁴³ Where possible, the availability of point-of-care testing (POCT) devices (e.g. ROTEM or TEG), particularly in tertiary-level facilities, was suggested for improving efficiencies in testing, turnaround times for results, and clinical decision-making. Research shows that the use of TEG/ROTEM decreases blood product transfusions and surgical re-exploration due to postoperative bleeding, including a lower incidence of acute kidney injury and thromboembolic events.³⁴⁹⁻³⁵¹ Minimising iatrogenic blood loss by using small-volume tubes for testing, reducing phlebotomy, and unnecessary repeat laboratory screening was also advocated.

7.6.3.1.3e. Haemorrhage

Massive haemorrhage protocols were deemed essential, including specific protocols for PPH, trauma-associated haemorrhage, and cardiac surgery-associated haemorrhage. Participants stated that these are commonly encountered surgical emergencies faced in South African hospitals and are associated with high blood and blood product usage. Meybohm *et al.* also advocate for massive haemorrhage protocols and add that protocols should be extended by specific algorithms for different subgroups of high-risk patients, such as postpartum, trauma, cardiac surgery, and transplantation of solid organs with associated haemorrhage.³⁶ Haemorrhage protocols should include guidelines for laboratory testing (including viscoelastic testing) and transfusion of blood and blood products, including RBCs, plasma, platelets, cryoprecipitate, and factor concentrates.³⁶

Participants added that PPH and trauma-associated haemorrhage cases are not only seen at tertiary hospitals in SA, but such cases are also encountered in primary care facilities (regional hospitals). As such, these facilities should be equipped to provide reasonable support until patients can be managed in the appropriate care facilities. The availability of blood for transfusion to these patients was deemed critical to saving their lives. Guidelines for the use of antifibrinolytic agents such as tranexamic acid were considered essential. There was consensus that tranexamic acid is a cost-effective, efficient, and safe modality for reducing bleeding and should be available across all healthcare levels.

Furthermore, guiding protocols for careful post-operative vigilance and patient care management were considered mandatory to ensure a journey of quality care and improved outcomes for surgical patients. It was emphasised that peri-operative procedural tools should be directed at keeping patients haemodynamically stable. This is key to reducing the need for blood transfusions.

Overall, the PBM tools recommended in this study for the surgical setting closely align with the three-pillar, nine-field matrix described as applied in the Western Australian PBM programme.^{5,163}

7.6.3.1.3f. Preventative care

In addition to specific tools for optimising erythropoiesis, minimising bleeding and blood loss, and harnessing and optimising the physiological reserve of anaemia, the concept of preventative care as an important healthcare imperative emerged as an overarching theme. Tools for preventative care, such as prevention and management of ID in the preoperative phase, avoiding and treating infections promptly, monitoring patients on anticoagulant therapy, and avoiding medications, foods, herbs, and supplements that can cause anaemia and bleeding, were deemed essential across all levels of healthcare.

The concept of preventative care recommended in this study aligns with research outlining the strong economic argument for PBM. Billions of people with anaemia and micronutrient deficiencies, and millions with acute and chronic blood loss and bleeding disorders, represent some of the world's biggest but largely **preventable** public health and health economic burdens.^{16,24,133} Again, PHC facilities being the entry point to medical care for the broader population of patients in the country were considered the ideal setting for early detection, prevention, and correction of anaemia, even before the preoperative phase.

7.6.3.2 Product-focused tools

7.6.3.2.1 Blood bank and transfusion-related protocols

There was agreement that although blood transfusions can be lifesaving, the potentially life-threatening immunological and non-immunological risks associated with transfusions demand that doctors apply sound clinical reasoning in their decisions to transfuse. Participants emphasised that blood is not only an expensive modality, but also a scarce and precious resource in SA, where blood shortages are a chronic problem.

When blood stocks are low, blood banks have no choice but to institute national cutbacks on blood orders. This has multiple implications which include but are not limited to delays in treatment, delays in surgery, longer hospital stays, and inconvenience to patients. These factors exert strain on both clinical services and blood services. On the clinical side, doctors become frustrated at not getting 'enough' blood at the right time. Blood services make additional appeals to the public for more donations, whilst they appeal to clinicians to apply judicious and restrictive use of blood.

Participants felt that the call for the optimal use of blood should not be motivated merely by chronic blood shortages – judicious blood use should be the standard norm. Transfusing hospitalised patients with 'perceived low Hb levels', even haemodynamically stable patients, was highlighted as a common practice in both public and private hospitals. Transfusing patients to increase Hb levels without identifying and treating the underlying causes was condemned and likened to "pouring precious fluid into a leaking bucket". This was deemed a risk-heavy practice and health resource wastage.

7.6.3.2.2 Transfusion decision-making

Indications for transfusion should take into consideration patient-specific factors (e.g. age, diagnosis, comorbidities), laboratory values (e.g. Hb, platelet count, coagulation testing), presence or absence of bleeding, and physiologic factors (e.g. oxygenation, hemodynamic status).³⁶ Where transfusion cannot be avoided, policies guiding restrictive transfusion thresholds and single-unit transfusion practices were advocated. A transfuse and assess strategy was recommended, rather than the habitual standard practice of ordering two units of blood for adult patients.

Some participants explained that as far back as their training as interns and junior doctors, ordering one unit of blood at a time for adult patients was unheard of. The ordering of two units of

blood as a standard minimum has been a longstanding routine practice, likened to an “unwritten rule”. In present times, many clinicians believe that ordering anything less than two units at a time is a wasted effort. Concerns were therefore raised that there may be resistance, potential lack of support, and poor uptake of the advocated single-unit transfusion strategy, particularly in hospitals that do not have onsite blood banks.

Drawing from their experiences, participants claimed that hospitals that do not have onsite blood banks tend to “over order”, merely to ensure the availability of blood as a precautionary measure to prevent transfusion delays. Over-ordering contributes to blood wastage. Furthermore, some patients end up getting transfused unnecessarily simply because blood ordered “just in case” becomes available at the patient’s bedside. Unused units of blood may be returned to the blood bank; however, if not returned within a stipulated time, or if the blood is returned in an unsuitable condition (e.g. out of temperature limits, tampered with, etc.), the units have to be discarded. Such practices magnify the blood demand-supply challenges in the country, and in certain circumstances, they deny or delay transfusions to patients with the right clinical indications.

Ordering only what is needed at the right time for the right patient with the right clinical need was deemed the right practice. Weighing the risks and benefits, including restrictive transfusion measures with particular considerations for obstetric/trauma cases, was deemed important. Also, the costs of blood transfusion versus non-transfusion treatment modalities should be compared and clinically analysed in terms of best patient outcomes. It was therefore recommended that the toolkit comprise educational material and policies on the clinical indications for the appropriate use of the various blood and blood components, risks, hazards, and costs of each, including surcharges and levies for emergency and out-of-hours testing and services.

Outlining the legal and ethical implications of transfusing patients for whom transfusions are not clinically warranted was deemed essential. Approaches to preventing transfusion risks and

hazards by avoiding transfusions and adopting suitable alternatives are key. Overall, participants felt that ensuring the availability of non-transfusion PBM treatment modalities, supported by procedural tools that clearly specify when and how they should be used, would be an effective way to reduce unnecessary transfusions. This called for unlearning entrenched norms and replacing them with evidence-informed best practices.

7.7 UNLEARNING TO NEW LEARNING

Participants recognised PBM as an opportunity to correct the long-standing Hb-driven, knee-jerk approach to prescribing blood transfusions: “Unlearning is the new learning.”³⁵² This is a conscious and intentional act that involves abandoning, eliminating, rejecting, discarding, or giving up something, with that something being particular values, assumptions, knowledge, or behaviour at the individual level and knowledge, assumptions, or routines at an organisational level.³⁵³

The WHO acknowledges that a key challenge to PBM implementation lies in changing the clinical culture and physician behaviour, thus calling for clinicians and others to unlearn and abandon certain old practices and adopt the broad integrated approach of scientifically based PBM.¹⁶ Unlearning of harm-associated historic and current blood transfusion practice norms was deemed achievable through aggressive education programmes that enable clinicians to translate knowledge gained into making clinically informed decisions that optimise the care of patients.

7.8 EDUCATIONAL LIMITATIONS

7.8.1 Undergraduate and postgraduate medical education

In this study, the lack of locally relevant PBM and transfusion medicine education programmes in the undergraduate, postgraduate, internship, and specialist phases of training for doctors and nurses emerged as an education failure. This contributes to PBM awareness and knowledge deficiencies being widespread among nurses, medical interns, junior and senior doctors, GPs, and specialists.

Among other factors, the gaps surrounding anaemia diagnosis and management were attributed to existing education and knowledge deficiencies. When care does not match knowledge, it may fail to help patients and overall healthcare, either by omission (failing to do what would help) or by waste (doing what cannot help).³⁵⁴

In the context of PBM, omission or “failing to do what would help” translates to doctors not correctly identifying and treating the underlying causes of anaemia and bleeding in patients. The waste aspect or “doing what cannot help” translates into administering inappropriate treatments, such as unnecessary blood transfusions, when in fact patients can be treated with less harmful, evidence-informed modalities such as nutrient supplementation or antifibrinolytic agents. Medical curricula and education programmes that promote EBPs are therefore advocated to facilitate students’ acquisition of EBP knowledge and skills, which will be enhanced over time with levels of increasing exposure and complexity.³⁵⁵

Some participants shared their knowledge-enrichment journey of having attended the first and only accredited transfusion medicine learning programmes in SA. These learning programmes (Postgraduate Diploma in Transfusion Medicine and Master’s in Transfusion Medicine), aimed at bridging the transfusion medicine knowledge gap among medical doctors and increasing the collective pool of expertise in blood transfusion in SA, were implemented at the University of the Free State (UFS) in Bloemfontein, SA in 2008.³⁵⁶ Although excellently tailored towards improving transfusion medicine practice in SA and Africa, it targeted doctors only, and was largely transfusion and blood banking focused. These education programmes are no longer available.

Globally, and in this study, the mandatory need for PBM and principles of good clinical transfusion practices to be included in the undergraduate and postgraduate training of doctors and nurses was strongly advocated. Research supports the need for concerted efforts to integrate PBM in

undergraduate and postgraduate medical education in SA to establish a sound knowledge base of PBM principles among clinicians.^{34,42,133}

7.9 EDUCATION AND TRAINING PROGRAMMES

An important contributing factor to the successful adoption of PBM in Western Australia was the implementation of education programmes for hospital staff and medical students. Education was directed at clinicians' tolerance of anaemia and addressing the perceived belief that anaemia was appropriately corrected by RBC transfusions. Regular, ongoing education helped disseminate and embed desired practices.¹³¹

Participants expressed confidence that despite the lack or absence of PBM in undergraduate and postgraduate medical education curricula in SA, PBM knowledge and awareness could still be developed through structured, well-presented, regular, and ongoing hospital-based education seminars and webinars. Such education initiatives, combined with a toolkit of accessible, well-tailored educational material (videos, diagrams, lectures/podcasts, literature, checklists, algorithms, templates, etc.), policies, procedures, and protocols, can lead to a positive shift in clinicians rethinking outdated practices and embracing the need for evidence informed PBM practices.

7.9.1 Continuous learning

In light of the extraordinary pace of global knowledge production, the education and training of care providers should be flexible, evolving in line with changes, advances, and current best evidence in healthcare.³⁵⁷ Education on EBPs, such as PBM, should not be once-off educational interventions, but rather a continuum of ongoing learning. Continuous education is necessary to ensure that clinical practices evolve to align with evidence-informed best practices that will be carried through as junior practitioners progress in their careers, becoming specialists, researchers, and medical educators. Through this, PBM practices can filter down to junior

clinicians, enabling them to be better skilled in delivering PBM-aligned principles of care as routine practice.

7.9.2 Educating the educators

The education of medical educators and senior practitioners emerged as an important need. According to the participants, medical educators and senior clinicians often teach what they know, what they were taught, and what they currently do in the clinical environment. This classically applies to the engrained practice of administering blood transfusions without adequate consideration of the patient's clinical condition. Participants attributed this to the longstanding miseducation or gaps in education.

Educators and senior clinicians also serve as mentors. They are powerful role models for shaping the knowledge, behaviours, and medical practices of students and novice practitioners. Educators must, therefore, be equipped with up-to-date knowledge of best practices. They should be well-informed and resilient in taking the lead in championing best practice standards, which they readily impart to their trainees or mentees. It was, however, noted that establishing a culture of PBM in hospitals cannot be achieved by doctors alone. The important contribution of nurses on the clinical side, and the support of healthcare leadership and associated stakeholders on the administrative side, were recognised as essential for driving the PBM agenda.

7.10 GETTING NURSES ON BOARD

Participants raised concerns that nurses are currently “left out” of PBM engagements and education initiatives. PBM webinars and seminars in the various provinces across the country had a notable lack of representation and input from nurses. In terms of hierarchy in healthcare, doctors almost always rank as superior. Although the participants in this study were mainly doctors, they ranked the role of nurses as being high in PBM and overall healthcare, explaining that nurses are

the “eyes and ears” of doctors. Their close bedside relationship with patients gives them an important degree of influence over decisions that doctors make.

Participants felt that nurses are better advocates for leading practice changes and adherence to protocols. One participant aptly framed the superior role of the nurses, claiming that “when patients are ill, we do not *doctor* them back to health; we *nurse* them back to health”. Research also points to nurses being ideally positioned to contribute to and lead the transformative changes occurring in healthcare by being fully contributing members of the interprofessional team.³⁵⁸ They often take on the role of leaders, scientists, innovators, advocates, educators, and at times a combination of many or all of these roles, and in present times, nurses are being called on to contribute to and even lead the development of effective strategies for improving population health.^{359,360}

In the PHC setting, nurses are usually the first point of care for patients. They are therefore important role-players in the early detection and correction of anaemia. They are also in an ideal position to educate patients on important topics of anaemia and ID, self-care, diet, nutrition, how to take oral iron, and the consequences of untreated anaemia, including non-adherence to treatment. In critical care units and surgical settings, they have a major role in post-operative care. They should therefore be champions of PBM-aligned care, emphasising the need for them to be equipped to provide such care.

In the Western Australian PBM implementation experience it was reported that nurses from various wards served as PBM champions. They attended regular PBM education on multidisciplinary levels of PBM and transfusion safety. They also served as positive role models disseminating information to their colleagues by creating anaemia and ID awareness, monitoring transfusion practice, and playing an instrumental role in policy development, staff education, and process changes.¹³¹

Also, in many HICs, perioperative anaemia clinics are nurse-led. The role of nurses in PBM should not be underestimated. Furthermore, task shifting to nurses, which entails the rational distribution of primary care duties from physicians to non-physician healthcare providers such as community health nurses, is increasingly advocated as a potential solution to overcoming current shortfalls in physician populations in LMICs.³⁶¹ Getting nurses on board and educating them together with doctors at an early onset was deemed important in establishing a PBM culture in hospitals.

7.11 EDUCATION AND TRAINING TOOLS

7.11.1 Doctors and nurses

Participants felt that empowering doctors and nurses in private and public (primary, secondary, and tertiary) hospitals with PBM knowledge, skills, and guiding tools is an important step toward building strong clinical partnerships for the adoption of PBM. Educational topics considered essential for doctors and nurses include the need for a clear definition of what PBM is and is not, the pillars of PBM and how they can be practically applied, and the inter-professional multidisciplinary patient care paradigm incorporating all clinical and non-clinical stakeholders that need to collaboratively work toward the common aim of achieving best patient outcomes.

Improving knowledge and understanding of anaemia and ID, the diagnostic approach for the various categories of patients (pregnant and non-pregnant women, children, surgical patients, cancer patients, PLWHIV), pathways for administering correct treatment, minimising bleeding and blood loss in surgical and non-surgical patients, oral and IV iron use, demystifying the myths surrounding IV iron, ethical and clinical aspects of anaemia management and blood transfusion, blood bank services, transfusion risks, hazards, costs, and alternatives were recommended.

Education on how to optimally utilise healthcare resources in resource-constrained settings was deemed essential. Participants reported that many healthcare settings, including PHC facilities and district hospitals, lack the necessary resources for the early detection and management of

anaemia. Lack of staff training, laboratory testing limitations, limited supplies of haematinics, and other factors were some of the challenges reported.

Resource, capacity, and manpower challenges, access to, and affordability of treatment modalities, high patient numbers, and lack of availability of hospital beds are some of the many realities clinicians face. Their training must therefore enable them to be adaptable and to apply practical reasoning as to which practices to optimise care they should adopt, in what setting, and for which patients, given the resources they have available. Such education must be introduced early in their training to prepare them for clinical practice in the South African healthcare environment. Training supplemented by clear guiding policies and procedures tailored to the resource and infrastructure capabilities of the various levels of hospitals will empower clinicians, enabling knowledge translation in the clinical environment.

7.11.2 Healthcare leadership and administrative stakeholders

Realising a future in which opportunities for optimising health emerge through the disruption of long-standing healthcare paradigms requires leadership that is well-educated, enlightened, diverse, courageous, and competent.³⁶⁰ Creating PBM awareness among healthcare leadership and funding stakeholder groups, such as hospital management and health budget custodians at both government and hospital levels, including health insurance funders, was identified as an important need.

PBM provides a rare opportunity in healthcare for getting “more out of less” by reducing overall treatment costs and improving patient outcomes while simultaneously improving population health status.¹⁶ This is precisely the ‘win-win’ argument that should be presented to this stakeholder group as justification for prioritising PBM. Making them understand the health economic benefits and how PBM can help create and sustain an improved healthcare culture was deemed essential for the buy-in of these important support stakeholders.

Strategic, health economics-focused education presented at the right level of interest and influence, directed primarily at cost-saving outcomes, the ethical basis of PBM, and the associated patient, community, and population health benefits, were considered necessary. Presenting cost comparisons between blood and blood products versus alternative anaemia treatment approaches, while accounting for the risks associated with the former, can garner support for PBM and ease some of the resource and infrastructure barriers clinicians face.

Current infrastructure limitations, inadequate budget allocations for laboratory testing, siloed healthcare budgets (separate budgets for laboratory testing, pharmacy, blood budget, etc.), and gatekeeping restrictions were cited as practical barriers to PBM. A sound understanding of the patient and health economic imperatives of PBM can influence support for access to fundamental PBM modalities such as haematinics (e.g. iron, B12, folate), pharmacological or haemostatic agents (e.g. antifibrinolytics), functional cell-saving devices in surgical settings, and point-of-care devices at appropriate levels of health facilities. Educational tools presenting explicit yet simple illustrations of how spending a little more on the laboratory and pharmacy budgets can result in significant savings in the blood budget can enable the re-assessment of healthcare budget allocations in favour of PBM.

7.12 OPPORTUNITIES TO CONSIDER

7.12.1 Gatekeeping and stewardship

Gatekeeping has historically been implemented in many healthcare systems, including SA, as a strategy to manage healthcare costs and ensure appropriate utilisation of services.³⁶² Electronic gatekeeping for laboratory testing has been implemented in various South African public hospitals and is based on criteria such as the minimum retesting interval, healthcare location, level of experience and discipline of the requesting clinician, and specific ICD-10 codes.³⁶³

Participants declared that in certain healthcare settings it was not always possible to perform the right mix of tests, such as ferritin screening and iron studies, to conclusively diagnose conditions such as ID which could easily be corrected at PHC level. Efficiency in making a correct diagnosis early in patient care would improve treatment efficiencies, whereas delays cause patients to become complicated.

Gatekeeping, although essential to prevent health resource abuse, should not be a barrier preventing efficient diagnosis, and cost-effective and safer treatment options for patients. Educating decision-makers and gatekeepers will help them to gain the right insights, enabling informed decision making. As mentioned earlier in section 7.6.3.1.1d, gatekeeping measures instituted by health insurers restricting access to IV iron access in the private sector is a classical barrier to evidence-informed treatment.

It was a common concern that blood transfusion, similar to a tissue transplant, is an expensive, risk-associated intervention; however, no gatekeeping measures (such as motivation or pre-authorisation) exist to ensure stewardship of altruistically donated allogenic blood.

7.12.2 Transfusion stewardship programme

Antimicrobial resistance (AMR) has been acknowledged as a serious global public health threat, leading to the launch of a Global Action Plan by the WHO in 2015, which initiated the development of AMR strategies and policies to prevent the overuse and inappropriate use of antibiotics.³⁶⁴ Several countries, SA included, have implemented governance structures, AMR committees, and terms and references to monitor and control antibiotic usage in public sector hospitals.³⁶⁵

In the same vein, the WHO is appealing for countries across the globe to urgently implement PBM programmes as a standard of care to address the risks of anaemia, ID blood loss, and coagulopathy.¹⁶ Similar to how the health system has taken steps to respond to the prevention of AMR resistance, participants felt that SA should adopt a similar strategy to institute appropriate

governance and stewardship measures to prevent the irresponsible use of blood and blood products.

The PBM toolkit comprising standardised guidelines and national policies would support such a strategy, establishing vigilance and informed clinical decision-making. It was further recommended that blood transfusion request forms be expanded to include questions on whether treatment options other than transfusion have been considered. It was also recommended that the ordering of blood and blood products be supported by a motivation indicating why blood is needed for the treatment of haemodynamically stable patients. All non-emergency requests should be sanctioned by senior personnel. Surveillance measures are important for entrenching accountability.

7.12.3 Monitoring and surveillance

As part of transfusion stewardship, structured surveillance systems were recommended to monitor the ordering and usage of blood and blood products. Such approaches have proven to be successful in reducing unnecessary transfusions.^{41,42,52} Infrastructure limitations, particularly, the absence of electronic blood-ordering systems in hospitals across all sectors, were reported as a barrier to real-time tracking and monitoring of blood ordering and usage. Hospitals therefore depended on the blood services to provide statistical data on blood ordering, usage, and wastage.

Participants felt that electronic blood-ordering systems could enable real-time blood-ordering and monitoring dashboards within hospitals and wards. Such systems can trigger swift investigation, thus preventing unnecessary ordering, wastage, and harm to patients. Electronic systems with built-in control measures (such as Hb values, iron and ferritin levels, and the patient's haemodynamic status, etc.) as markers to validate orders and trigger warnings/alerts, as applied in other countries, can serve as risk mitigation for unwarranted transfusions.^{41,42,52}

Participants acknowledged that such technologies incur costs and may not be prioritised in promote vigilance, and address transfusion overuse among their teams through education and internal monitoring platforms.

7.12.4 Patient empowerment

There was unanimous agreement that in addition to educating and empowering care providers and healthcare decision-makers, patients also need to be empowered with the right information that can enable them to better understand their health status and contribute to decisions surrounding their care. Rather than passively presuming that ‘doctor knows best’, patients should actively engage with their care providers to understand their diagnosis and available treatment options, weighed against risks and benefits, and then agreed upon with consent.

With regard to blood transfusion, the principles of ethics and proper informed consent were deemed important educational needs.

Consent must be a legitimately informed process and not something imposed on patients. There was acknowledgment that the current consent process for blood transfusions is flawed in both the public and private healthcare sectors. Often patients are asked to consent upfront should the need for transfusion arise at any stage of their in-hospital treatment. This practice was condemned, as it violates the medical ethical principles of beneficence (doing good), non-maleficence (do no harm), and autonomy (giving the patient the freedom to choose freely). It can also subject clinicians to litigation, should patients suffer adverse events or fatal outcomes.

Patients have the right to refuse blood transfusions; this must be respected and optimally managed. Physicians must recognise that informed medical choice is an educational process that can positively impact the patient-physician alliance, and patients must be given an equal role in this relationship by being educated to make informed choices.³⁶⁶

This will enable them to make rational choices and will create a relationship of trust and partnership grounded in shared decision-making.

Participants felt that it is easier to treat informed rather than uninformed patients. Research suggests that informed patients who actively participate in decisions about their own care tend to have better outcomes, higher levels of satisfaction, lower costs, and higher functional status compared to those in more passive roles.^{354,366,367} Overall, empowered patients are better enabled to adapt, question, challenge, and change their daily practices to improve their health and social well-being.³⁶⁸

7.12.5 Education and training for patients

In addition to autonomy and informed consent, educational aspects recommended for patients included the need to understand the basics of anaemia and ID, including the causes, signs, symptoms, and outcomes of untreated anaemia. The implications of HMB, and consequences of ID in pregnancy, and the associated cognitive impact on children, were deemed essential educational topics. There was consensus that oral iron can cost-effectively correct ID in most situations if taken correctly. Educating patients on how and when to take oral iron is necessary for them to gain the full benefit of the treatment. Awareness of the potential side effects and what to do should they experience any is important in preventing self-discontinuation of treatment due to discomfort patients often experience.

Educational tools for patients in the form of information booklets, pamphlets, posters, videos, and even mobile apps and applications were recommended. It was mentioned that patients often wait several hours in waiting rooms before being seen by the doctor. This waiting period and environment could be utilised to create awareness using continuous or looped videos or talks presented by healthcare workers. Better-informed patients are likely to apply the information gained to improve self-care and spread health awareness among their families and communities.

According to the WHO, reducing risks to health is not only the responsibility of governments and care providers – it rightly remains a vital preoccupation of all people, in all populations, and of all those who serve them.³³³ Educated patients contribute to empowered communities and ultimately empowered populations.

7.12.6 Community health workers as patient blood management education champions

A significant proportion of the South African and African population live in rural and remote areas with limited access to quality healthcare services. In SA, community health workers form an important link between communities and the public health system. They provide a wide range of health promotion and disease prevention services within their communities, making them a particularly valuable cadre of health workers, especially in rural health districts.^{369,370}

Participants expressed that community health workers have an important degree of influence in communities. They are important health advisory sources for patients and communities, particularly in rural settings. They are therefore optimally positioned to disseminate education on fundamental PBM and health-related topics such as anaemia and ID, women and children's health, nutrition, and so on. Most people will choose to adopt healthier behaviours, especially when they receive accurate information from authorities they trust and when they are supported through good health promotion programmes.³³³

Participants were of the view that communities are more likely to be receptive to information shared by community health workers they know and trust. Through them an atmosphere of trust can be created, allowing community members to ask questions, seek clarity, engage in debate, and contribute to solutions for improving the health of their communities. Also, education can be tailored in a language and format that can be easily delivered and accepted by communities. Therefore, opportunities and support tools for the recruitment, training, and empowerment of CHWs as community education champions should be explored.

7.13 TOOLKIT LOOK AND FEEL

It was recommended that the PBM toolkit be available in a digital format, comprising an all-inclusive package of videos, diagrams, lectures, podcasts, policies, procedures, protocols, checklists, and templates for easy access and application. The internet has provided fertile ground for toolkit dissemination, based on the ease with which information can be disseminated virtually in an engaging and multimodal manner to a wide variety of audiences.²³⁷

An app that can be easily downloaded and is not heavily data-dependent would be ideal. This will ensure access to the tools at all times. The toolkit should also provide regular alerts, practice updates, and changes to policies and procedures. It should allow for posters and educational material for the various stakeholder groups to be printed in an engaging, meaningful format, emphasising patient-centred care.

There was also support for a paper-based toolkit format to ensure easy access in settings where limited or no internet connectivity might prevent access to the electronic version. However, maintaining updated information in a paper-based format necessitates dedicated administrative support to implement revisions, which may prove challenging. The need for separate PBM toolkits for the public and private sector hospitals was not supported; however, a toolkit specifically for nurses was well supported.

In developing the tools for the toolkit, it is worthwhile to note that educational material, and certain basic policies, procedures, protocols such as the general management of anaemia and deficiency, may already be available locally and/or internationally. Other tools may need to be developed from scratch. Guidelines, templates, checklists, etc., available through international platforms such as the Association for the Advancement of Blood and Biotherapies, Western Australia Department of Health, the 'Choosing Wisely' campaign in the USA, may be accessed, referenced, and, with permission, adjusted and imported into the toolkit.

Although numerous PBM guidance measures have become available over the recent period, their practical utility in the clinical environment is what truly matters. This is especially relevant in countries like SA, where we are caught between the 'resource-advantaged' advice and guidelines of HICs and the lack of resources to implement these in LMIC settings. Available procedures should therefore be reviewed and tailored to align with the resource and infrastructure capabilities of the various healthcare levels in SA.

7.14 STEERING THE IMPLEMENTATION

7.14.1 Growing the patient blood management community of practice

Currently, there is an SSA PBM WhatsApp group comprising approximately 300 health professionals, primarily doctors from a wide variety of specialties across Africa and elsewhere. PBM champions, both local and abroad, contribute to information sharing on this platform. It thus serves as a powerful education and information tool, fostering PBM awareness through the sharing of literature, clinical experiences and practices of PBM champions in their respective healthcare settings. It is also a platform where PBM-related questions and concerns are raised, clarity sought, and responses are received, usually in real time from discipline-specific local and international experts in the group.

Participants acknowledged that this social media group was a powerful educational and information-sharing platform for growing knowledge and awareness of PBM. It was recommended that this platform be expanded to include other key non-clinical stakeholders, such as hospital administrative and financial leadership, and health insurance funding representatives. It was suggested that the existing WhatsApp group be included as a support platform of the PBM toolkit for information-sharing and guidance. This will also grow and expand the pool of PBM champions.

7.14.2 Patient blood management champions

Implementation science experts claim that implementation is a social process, requiring champions, networks, and human or resource drivers to initiate the process.²⁴⁰ This study revealed that current PBM champions have active involvement in the HTCs in various hospitals, some serving as committee convenors and leaders. Their role in steering the PBM agenda makes them suitable influencers, leaders, change agents, and mentors for steering toolkit-led PBM interventions.

It is often a single PBM champion or a small group of champions that takes the lead in initiating and implementing practice improvement initiatives. However, to successfully execute and sustainably run a small or large-scale PBM effort, PBM champions must either create a powerful governance structure themselves or engage those with the power and resources to establish that structure.^{17,133}

7.14.3 Hospital transfusion committees – a governance structure for patient blood management

It appeared that HTCs exist mainly in the public sector tertiary hospitals and not in the private sector hospitals. Participants explained that the HTCs served a surveillance role, largely monitoring blood and blood product ordering, usage, and wastage within hospitals, seeking justification for high or increased usage, and reporting transfusion-associated adverse events. The overall aim is to correct inappropriate ordering practices; however, accountability measures for overuse/wastage appeared to be lacking.

PBM champions in partnership with HTCs were deemed an appropriate governance structure with sufficient influence and authority to steer hospital leadership and necessary stakeholders within hospitals towards adopting a PBM culture. It was, however, noted that while some hospitals had well-established, optimally functional HTCs with good collaboration and input from the blood

banks, other hospitals struggled to set up or maintain the functionality of HTC. Lack of time and/or commitment from representatives, lack of representation from all departments, lack of leading champions and support from hospital leadership were some contributing factors.

Essential to the successful implementation of PBM is a committed hospital administration, personnel to manage and coordinate the identified PBM initiatives, a team of well-informed physicians, nurses, laboratory and blood bank personnel, and other support staff.¹²⁸ It emerged that although PBM is acknowledged and featured on the HTC agenda in some of the hospitals, the focus of HTCs remains largely product-orientated. PBM goals are not product- or transfusion-centred – rather, they are patient-centric, directed at improving patient outcomes.

The role and structure of HTCs therefore require strengthening, calling for strong leadership with sound knowledge and understanding of PBM to confidently lead the PBM agenda in hospitals. The inclusion of PBM metrics as measures of quality to be reported on is an important need. Access, availability, and usage of non-transfusion treatment modalities should be a standing agenda item of HTCs. Representation from all PBM-related medical disciplines in the committee is essential.

Going forward, it was recommended that HTCs be referred to as PBM Committees. Their role should be broader, prioritising patient safety and outcomes while reducing costs by advocating for cost-effective, minimal-risk, evidence-informed, clinically appropriate practices.

In addition to monitoring and auditing blood usage, PBM Committees should also assess and evaluate clinicians' motivations for prescribing blood transfusions and establish gatekeeping measures such as transfusion stewardship programmes in the respective hospitals.

7.14.4 Maintaining and sustaining a culture of patient blood management

Participants felt that endorsement of PBM by the DoH in SA would accelerate implementation, and add gravitas to the need for a PBM toolkit as a support mechanism at local and national level. Government endorsement would also initiate national-level PBM policies and procedures that will ultimately help establish consistent standards of clinical care across the country. However, in the absence of formal endorsement by the DoH, PBM goals can still be achieved through local champions and hospital leadership. Sharing and presenting success stories of patient outcomes and cost savings in quality improvement forums and hospital governance forums at local and national levels will generate interest and appetite for PBM. Government will eventually endorse PBM as a standard of care.

The PBM toolkit framework presented in this study serves to guide, support, entrench, and sustain a culture of PBM, not only as 'best practice' but 'next practice'. Next practice is a commitment to a process, not an end product; and in moving from 'best practice' to 'next practice' we acknowledge that the best solutions come from development, not imposition.³⁷¹ A continuous process of development and improvement, marked by unwavering perseverance and persistence in the face of challenges, should be the objective in implementing PBM. The lessons learned from this process can offer meaningful guidance for future efforts aimed at building and strengthening the infrastructure needed to direct, maintain, and sustain evidence-informed PBM practices.

7.15 CONCLUSION

In this chapter the framework for a PBM toolkit for the South African healthcare context was discussed. The barriers and challenges to the implementation of PBM in SA were summarised, linking the role of a PBM toolkit as an educational and clinical practice support mechanism to establish and sustain PBM practices in SA and beyond. The next and final chapter presents the recommendations, value, limitations, and conclusion of this study.

CHAPTER 8: SUMMARY, RECOMMENDATIONS, VALUE AND CONTRIBUTION, LIMITATIONS AND CONCLUSION OF THE STUDY

8.1 INTRODUCTION

The previous chapter discussed the framework for a PBM toolkit as a resource to guide the implementation of PBM practices. In this chapter the main findings are summarised, and the recommendations are presented. This final chapter concludes with an outline of the study's value and contribution, limitations, opportunities for further research, and conclusion.

8.2 AIMS AND OBJECTIVES OF THE STUDY ACHIEVED

The primary aim of the study was to develop a validated framework of cost-effective, feasible, evidence-based PBM measures to serve as a resource to guide the development of a toolkit that can support PBM implementation in hospitals and assist clinicians in optimising patient outcomes and minimising inappropriate blood transfusions.

The objectives of the study were:

- (i) To conduct a study of the available literature to gain a perspective on the PBM implementation experiences of countries across the globe regarding strategies and tools implemented, challenges and barriers encountered, and outcomes achieved.
- (ii) To explore the experiences of PBM champions currently working in or who have previously worked in South African hospitals, to gain their perspectives on the challenges and barriers to PBM implementation in SA, and the essential educational and clinical practice tools needed to support implementation.
- (iii) To gain validation through consensus from PBM experts on the essential, feasible, cost-effective, and evidence-based tools appropriate for a South African healthcare-focused PBM toolkit.

- (iv) To develop a broad framework as a template to guide the development of a PBM toolkit that can support PBM implementation in SA and beyond, thereby providing clinicians with educational and clinical practice tools to optimise the care of patients.

The literature study presented in Chapters 2 and 3, the results of the one-on-one semi-structured interviews presented in Chapter 5, the results of the Delphi survey outlined in Chapter 6, and the presentation and discussion of the PBM toolkit framework in Chapter 7, show that all four objectives and the overall aim of the study were met. In doing so, the problem statement highlighting the absence of a framework of tools to guide the implementation of PBM in South African hospitals has been addressed.

In summary, the framework represents a comprehensive set of tools grouped into four broad categories: (i) assessment, planning, and evaluation tools to assist hospitals with ascertaining readiness for PBM and planning the implementation; (ii) definitional tools to sensitise clinicians and other stakeholders to the correct definition of PBM, framing its important need in SA and beyond, as a patient and overall healthcare improvement paradigm; (iii) policy and procedural tools to guide clinicians in applying evidence-based practices in the clinical environment; and (iv) education and training tools to bridge the knowledge and education gaps among clinicians and other stakeholders.

The literature review, the one-on-one semi-structured interviews with the PBM champion participants in the qualitative phase of the study, and the Delphi survey in the semi-quantitative phase are considered to have been appropriate for their intended purpose and were effective in providing meaningful data. The 100% response rate in all three rounds of the Delphi survey was deemed highly satisfactory and can be considered to have contributed to the validity and reliability of the results.

8.3 VALUE AND CONTRIBUTION OF THE STUDY

This study makes a unique contribution by providing a novel and context-specific framework for PBM in South Africa, addressing critical gaps in existing healthcare practices. This work contributes significant value by proposing an actionable, evidence-based model that adapts international PBM principles to resource-limited settings, promoting safer and more effective patient care while minimising inappropriate blood transfusions. On a larger scale, this study provides a meaningful response to the WHO call to nations across the globe, LMICs in particular, to develop and implement strategies for adopting PBM as a standard of care.

To the researcher's knowledge, this is the first comprehensive research-based framework to guide the development of a PBM toolkit to support PBM implementation, not only in SA but also in Africa, other LMICs, and beyond.

The framework of tools adapted and tailored to the specific needs and resources of hospitals in SA and elsewhere will inform the development of a practical toolkit that can serve as a PBM implementation support mechanism and an educational and clinical practice guiding resource for the appropriate management of anaemia, ID, blood loss, and harnessing the physiological reserve of anaemia in medical and surgical patients. Ultimately, application of the tools in the clinical environment will, in the first place, enhance patient outcomes and, as a secondary benefit, reduce unnecessary transfusions. In doing so, this can ease the pressure on the blood supply in SA and elsewhere, save costs, and improve blood inventories, thereby making allogeneic blood more readily available for patients with the right clinical needs.

Figure 12 below shows the value of implementing PBM supported by a toolkit informed by the framework.

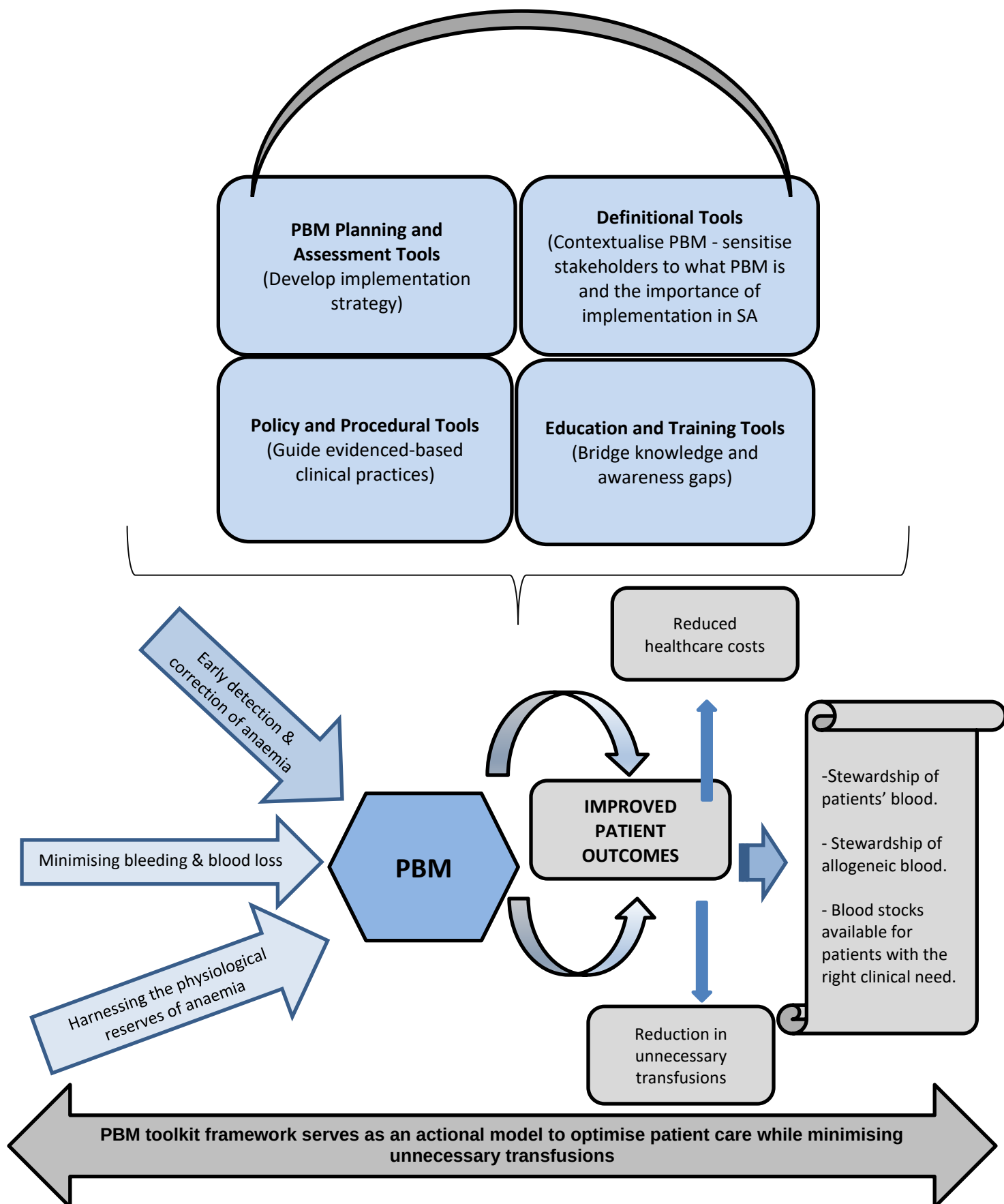


Figure 12: Value of implementing PBM supported by a toolkit informed by the framework. Diagram prepared by the researcher, Rambiritch 2025, for the purpose of this PHD study.

8.4.1 General recommendations

- **Steering implementation through PBM champions:** Currently PBM champions and the blood services in the country are independently and collectively leading education initiatives and steering PBM interventions in various hospitals. It is recommended that the findings of this study be shared with the growing pool of PBM champions, including the SSA PBM social media group, and the PBM lead consultants at the blood services in SA.
- **Developing the right focus:** HTCs and blood-user committees should be referred to as PBM Committees with focus directed at prioritising best care practices for patients, rather than being product-focused.
- **Getting hospital buy-in:** The PBM toolkit framework should be presented and workshopped by the active PBM champions to the full membership of HTCs, hospital management and leadership, and Heads of Department of the PBM-related disciplines within hospitals (Surgery, Anaesthesiology, Family Medicine, Internal Medicine, Obstetrics and Gynaecology, Paediatrics, Critical Care). The patient and healthcare cost-saving benefits underpinned by the WHO's appeal for the urgent implementation of PBM as a healthcare imperative should be explicitly shared with this important stakeholder group. Additionally, the consequences of not implementing PBM as a practical solution to the many healthcare and transfusion-related challenges faced in the country should be presented.
- **Implementation strategy planning:** A leading PBM champion or a leading group of champions with the HTCs or other hospital governance committees should form a core team to tailor a PBM implementation strategy by mapping the immediate and long-term PBM goals appropriate for their respective hospitals.
- **Needs assessment:** The assessment and planning tools should be used to evaluate current practices within hospitals and identify existing clinical practice gaps, including the education, resource, infrastructure barriers, and general challenges that need to be addressed. This will

determine which measures to improve and optimise practices should be implemented, taking into account what is most doable with the resources at hand. It is important to incorporate the balance between what is essential, what is desirable, what is not necessary (at least not immediately), and what must be done. The implementation plan should be feasible and practically doable with clear objectives defined by what needs to be done, when, and by whom.

- **Communicating the intent:** Key to the implementation is clear communication of intended practice improvement interventions to those directly affected, largely the clinicians, as the end users. Appropriately tailored definitional tools should be used to provide a clear exposition of PBM, and framing the goals and objectives, including the rationale for its implementation globally, and more so in SA. Early and regular communication is necessary to sensitise clinicians and keep them well-informed of what needs to be done, why, and when.
- **Establishing readiness through education and training:** Education and training tools tailored to the educational needs of doctors, nurses, and other support stakeholders should be implemented. Education and training seminars should be hosted at the broad hospital level, departmental level, and national level where possible. Mandatory attendance would be ideal and should be encouraged. Regular iterations and continuous learning interventions are likely to yield sustained knowledge and awareness of PBM. Education and training initiatives must enable knowledge translation, that is, application of knowledge into daily clinical practice. Education and training initiatives should ideally be facilitated by internal hospital staff that have sound PBM knowledge of the discipline(s) under discussion. Training led by internal champions as opposed to external parties is likely to encourage better uptake, or it may otherwise be perceived as changes being imposed by an external source.

- **Availability and accessibility to PBM modalities:** Basic PBM diagnostic and treatment modalities, such as nutrient supplementation, haematinics, antifibrinolytics, cell salvage, access to laboratory testing, and so on, must be available and accessible. Hospital-endorsed practices guided by official policies and procedures will serve as leverage, influencing support for the required PBM modalities in the appropriate healthcare setting.
- **Fit-for-purpose guiding resources:** Policies and procedures informed by the toolkit framework, tailored to ‘what must be done’, should be developed and made available and accessible to support the implementation. Policy and procedural tools must be clear and explicit to guide clinicians in applying patient-centred best practice standards. They must be educational, meaning they must help clinicians to know what to do, and to do what they know, in the right clinical setting for the right patients, considering the resources available.

Policy and procedural tools should not be static; they should be reviewed periodically and updated in line with new evidence. Where possible, national-level policies and procedures should be developed to standardise practices.
- **Building local and national collaboration and partnerships:** Champions and PBM Committees within similar-level hospitals should partner and work collaboratively towards tailoring and implementing PBM strategies supported by common policies and procedures. Some procedures may need to be developed from scratch, or they may be adapted from existing local, national, or international guidelines. Discipline-specific champions across the provinces and hospital groups should work collaboratively toward reviewing, revising, and developing the required policies and procedures. Such an approach is an important step towards ultimately developing national-level policies and procedures.
- **Establishing transfusion stewardship:** Transfusion stewardship programmes should be established as a mandatory measure in all hospitals. This should be hospital-driven and not a blood bank initiative.

Such programmes should employ the use of blood-accountability forms and clear clinical reasoning for requesting blood transfusions, sanctioned by senior clinicians. Such programmes will have a dual purpose, serving as a surveillance and monitoring tool to prevent inappropriate blood ordering, while also being an evaluation tool (metrics) to measure the outcomes of PBM interventions implemented.

- **Evaluating outcomes:** Valuable metrics to determine the effectiveness of PBM interventions are auditing and monitoring of blood and blood product usage, length of hospital stay, mortality, critical care admissions, acute kidney injury, postoperative infections, and the like within hospitals. This should be done at the broader hospital level and departmental levels within hospitals. A decline in the use of blood products is one indicator that PBM-aligned clinical decision-making and practices are successfully applied. This should also be validated by monitoring the use of alternative treatment modalities to transfusion, such as iron therapy, antifibrinolytics, etc., in treating iron deficiency, anaemia, blood loss, and coagulopathy. Audit and monitoring should be formalised and feedback given to all departments.
- **Practice improvement through behavioural change:** Potential pitfalls such as toolkit fatigue or inconsistent adherence to protocols should be appropriately managed. Non-adherence to policies and procedures, including the inappropriate use of blood and blood products, should be addressed first by education, followed by accountability measures that help clinicians unlearn engrained non-evidence-based practices and replace them with evidence-informed best practices. The Kotter model is a well-established culture and behavioural change model.³⁷²⁻³⁷⁵ The model comprises eight steps, starting with developing a sense of urgency, followed by building a guiding team, creating a vision, communicating the vision for buy-in, enabling action by empowering others to act, enabling and promoting short-term wins, keeping the momentum going, and anchoring and integrating the change into the culture

(making it stick). The Kotter model could be used as a guide for steering PBM-aligned clinical practice and behavioural changes in a coordinated stepwise approach.

- **Driving implementation through quality assurance and accreditation systems:** National-level incorporation of PBM into accreditation standards by regulatory bodies would facilitate systematic implementation by hospital administration. Incorporating PBM metrics when auditing hospitals can serve as a strong driver for implementing and sustaining PBM programmes, overall serving as indicators for quality assurance, quality enhancement, and continuous improvement. Furthermore, awarding accreditation to hospitals with active PBM programmes will provide national and international recognition, which can stimulate healthy competition between hospitals, all leading to patients benefiting from the collective efforts.

8.4.2 Recommendations for bridging medical education-associated deficiencies

- **Improvement in the medical education undergraduate curricula**

Similar to several other countries, this study also revealed that transfusion medicine is absent or insufficiently represented in medical education undergraduate curricula in SA. Although this is a valid finding, it must be noted that the field of transfusion medicine is vast, comprising regulatory aspects of blood donation, blood processing, laboratory testing, and immunological aspects linked to multiple antigens and antibodies within complex blood group systems. While the full bouquet of learning may be necessary for certain specialists, such as haematologists and transfusion medicine specialists (the latter a medical specialty that is non-existent in SA), this comprehensive level of knowledge is not necessary for all clinicians.

Undergraduate medical education should therefore incorporate the clinical care aspects of PBM, equipping clinicians with knowledge and skills to optimise patient care by stewarding the blood of patients and simultaneously stewarding the blood of donors.

Introducing early PBM education is a straightforward, practical solution to empowering students with the skills needed to enhance their clinical decision-making and avoid unnecessary transfusions. Extending PBM education through clear, well-structured curricula to postgraduate or specialist phases of study will enhance knowledge and skills development, producing PBM experts, advisors, researchers, and leading champions. However, education should not be a 'once-off' episode – a continuum of ongoing learning will be needed to entrench sustained and deep learning. Also, given the high turnover of clinical staff in hospitals, continuous PBM education is essential for new and existing staff

- **Well-trained, multidisciplinary PBM advisory personnel**

Well-trained, multidisciplinary PBM advisory personnel are needed to guide, support, and sustain a culture of PBM. Haematologists, by their scope and expertise in laboratory medicine, are closely connected to PBM. Among other specialist groups, haematologists should be important clinical advisors and advocates for PBM, particularly in SA and other similar settings that do not have dedicated transfusion medicine specialists. It is recommended that the existing training programmes for this specialist group be revised to include PBM-aligned learning outcomes that strengthen their role and better equip them to provide PBM advisory support to their clinical colleagues.

It is of note that SA has already taken a major leap toward developing university-accredited PBM learning programmes. Through innovation and collaboration between SANBS (project led by the researcher) and the UFS, the recent rollout of the online PBM short learning programmes for doctors and nurses is breaking new ground in Africa. The learning programmes, which incorporate the educational needs of doctors and nurses as recommended in this study, are the first of their kind in Africa, designed to enable doctors and nurses to become empowered clinical partners of the multidisciplinary PBM team. In light of the longstanding lack of PBM education in medical

schools in SA, one approach to bridging PBM medical education deficiencies in SA and Africa is to explore the possibility of making the PBM short learning programmes a mandatory educational requirement, at least for medical interns and potentially prospective registrars in relevant fields. The learning programmes tailored to the African healthcare context are available online, making them an accessible, wide-reaching solution to bridge existing PBM knowledge deficiencies among junior and senior doctors and nurses in SA, Africa, and beyond. Educating nurses and getting them on board is another opportunity to expand the pool of PBM champions and support the PBM agenda in hospitals.

- **Education and empowerment of the population**

Patients are the central focus of PBM, and ensuring their empowerment is essential. A formalised practical starting point and approach to educating the general population (made up of patients and healthy individuals) is to educate the blood donor population on the basic PBM educational aspects recommended in this study. Although blood donors largely represent a healthy segment of the population, they may sometimes become patients themselves, or they are friends and family of patients. Also, a significant number of individuals presenting to donate blood are deferred due to anaemia or ID. Educating blood donors on the fundamental aspects of anaemia, ID, consequences, prevention, and treatment options will, directly and indirectly, empower the patient population and the healthy population.

Implementing such education initiatives represents a tangible step towards improving PBM knowledge and promoting self-care among communities. Such education programmes can be supported and tailored by the two blood services in the country. Such education can be efficiently facilitated via an app or video before or during blood donations.

This will not only serve as a donor well-being initiative, but on a larger scale, it will also serve as an empowerment programme for improving overall population health. Patient/community educational material should ideally be in the various official languages of the country.

Finally, as the researcher and a non-clinician, I recommend that this study reach not only the clinical and healthcare provider audiences but also the ordinary citizen and the population at large, because collectively we can mitigate the risks of anaemia, ID, bleeding, and coagulopathy.

8.5 Limitations of the study

First, there was a broad consensus that changing clinicians' approach to managing anaemia by moving away from the automatic reliance on transfusion is essential to establish a culture of PBM across both public and private hospitals. Participants felt that uptake of PBM is likely to be slower in private hospitals compared to public hospitals, as private sector doctors tend to practice autonomously and usually face fewer restrictions in their clinical practice choices, such as the use of blood transfusions. Also, private hospitals do not generally have HTCs or blood-user committees, which was identified in this study as an important governance structure, not only for monitoring blood and blood product usage, but also as a vehicle to lead and monitor the implementation of PBM interventions in hospitals. Although the participants in this study represented both public and private sector hospitals, specific guidance measures for implementing PBM in private hospitals were not explored in detail.

Second, the PBM educational needs for nurses recommended and validated in the study were done so by study participants who were predominantly doctors. Input and validation from nurses would further strengthen these findings. A PBM toolkit specific for nurses was also recommended; however, the scope of this study did not allow the researcher to explore the tools appropriate for a nurse-focused PBM toolkit.

Third, the study does not include a cost-effectiveness analysis of the proposed tools, as this was beyond the scope of this study. This would be a valuable research undertaking and is therefore recommended as a future research opportunity.

Finally, the large amount of data collected in this study limited the researcher's ability to discuss all aspects in detail. Aspects that may have been briefly discussed in this study are intended to be shared in greater detail in publications that will stem from this research.

8.6 OPPORTUNITIES FOR FURTHER RESEARCH

It is recommended that the results of this study be presented at local, national, and international conferences and that the findings be published in accredited peer-reviewed journals.

It is recommended that further research be done on the following:

- Development of a PBM toolkit tailored according to the framework provided, that aligns with the needs and resources of specific or various healthcare settings.
- Outcomes gained from applying the PBM toolkit framework as a resource to guide the implementation of PBM in hospitals.
- Developing a PBM toolkit specific for nurses. Nurses' perspectives on the essential nurse-focused PBM educational needs aligned with their role in the multidisciplinary PBM team.
- Strategies to engage governance structures within and external to hospitals, including the DoH, to secure formal endorsement of PBM.
- Resource challenges (staffing, medications, equipment, etc.) that impede PBM implementation, and how to address these.
- Analysis of the cost-effectiveness of the proposed tools supported by a priority matrix, comparing the cost, impact, and feasibility of PBM interventions (e.g., preoperative anaemia clinics vs. tranexamic acid rollouts).
- PBM strategies for settings with unreliable infrastructure, where digital tools, refrigerated IV iron, etc., may be impractical, and exploration of approaches for adapting digital tools to infrastructure-limited hospitals.
- Developing a PBM implementation roadmap and establishing a monitoring framework

of core metrics

- Considerations for establishing PBM programmes in private sector hospitals in SA.
- Incentivising PBM by offering recognition and accreditation rewards.
- Exploring the role and value of community healthcare workers in championing PBM education among patients and communities.
- Exploring opportunities for partnering with and bringing on board the skills and influence of public health experts in supporting PBM.

8.7 SUMMARY AND CONCLUSION

The economic, social, and health risks associated with anaemia, iron deficiency, bleeding, and coagulopathy, more so their inappropriate management, are compelling reasons for governments to endorse PBM as a healthcare improvement opportunity. Governments are ultimately the stewards of health resources and have a responsibility to protect their citizens.³³³ The WHO advocates for governments to take bold and determined actions against major risks to health, in the knowledge that the likely result within the next ten years will be large gains for the health of their citizens.³³³ The patient and overall healthcare gains, including the reduction of unnecessary transfusions, by formally establishing PBM programmes in South African hospitals should therefore not be underestimated.

Although reducing the use of blood and blood products is not the primary aim of PBM, this study stemmed in part from concerns surrounding the inappropriate use of blood transfusions by clinicians, contributing to the blood demand-supply imbalance. This study argued that calling for more blood donors is not the primary solution – what is needed is the empowerment of clinicians by equipping them with the right knowledge and clinical practice tools to optimise the care of patients using evidence-based PBM-aligned patient-focused clinical care pathways. The alignment of national policies with international imperatives and guidance is of value.

An important resource to look forward to is the soon-to-be-released WHO guidance document for the implementation of PBM.

Also, partnerships and collaboration with international societies, such as the Network for the Advancement of Patient Blood Management, Haemostasis and Thrombosis (NATA), SABM, and IFPBM, can offer opportunities and potential solutions to challenges faced in SA and elsewhere. Eichbaum *et al.* recommend collaboration between countries and regions to enhance the global adoption of PBM, whereby experiences from developed countries can be helpful to less-developed countries in avoiding mistakes encountered.⁵⁴ However, innovations and opportunities to overcome challenges, clinical practice changes, and lessons learned from countries like South Africa can transform PBM education and practice and set a precedent for other similar healthcare contexts, thereby contributing to global improvements in PBM.

The researcher's view is that there is no perfect strategy for implementing PBM, nor will PBM be embraced with the same level of enthusiasm and resilience everywhere. More PBM champions are needed, and many barriers and gaps need to be bridged, particularly the behavioural unlearning of entrenched transfusion practices of the past and present. Despite the barriers, PBM is possible today, and persistent efforts should be directed at establishing PBM as a health reform opportunity, one small intervention at a time if necessary.

The PBM toolkit framework presented as the outcome of this research offers substantial value by providing an actionable, evidence-based model that adapts international PBM principles to resource-limited settings. This innovative framework should enhance patient safety and care while minimising inappropriate and unnecessary blood transfusions. These findings are poised to transform and redefine PBM education and practice in South Africa and serve as a powerful benchmark for similar healthcare contexts globally.

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10. APPENDICES

Appendix A	Participant information leaflet and consent form
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APPENDIX A: PARTICIPANT INFORMATION LEAFLET AND CONSENT FORM

TITLE OF THE RESEARCH PROJECT: Developing a validated framework for a Patient Blood Management toolkit appropriate for the South African healthcare context

REFERENCE NUMBER:

RESEARCHER: Mrs Vanitha Rambiritch

ADDRESS: 52 Siphosethu Road, Mt Edgecombe

CONTACT NUMBER: Work: 031 7197500

Mobile: 082 874 8261

Dear Participant

My name is Vanitha Rambiritch and I am the Head of Learning and Development at the South African National Blood Service (SANBS). I am a current PHD student in the Faculty of Health Sciences at the University of Cape Town (Student number RMBVAN001). My PHD research is titled: **Developing a validated framework for a Patient Blood Management toolkit appropriate for the South African healthcare context.**

My study Supervisors are Professor Vernon J. Louw: *Chair and Head Division Clinical Haematology, Department of Medicine, University of Cape Town*, and Professor Estelle Verburch: *Clinical Haematologist and Associate Professor of Medicine. Division of Clinical Haematology, Department of Medicine, University of Cape Town.*

You are being invited to take part in a PHD research study that is titled: *Developing a validated framework for a Patient Blood Management toolkit appropriate for the South African healthcare context.*

Please take some time to read the information presented below which provide the details of this project. It is very important that you clearly understand what this research entails and how you could be involved. Also, your participation is **entirely voluntary** and you are free to decline to participate. You are also free to withdraw from the study at any point.

This study has been approved by the **Human Research Ethics Committee at the University of Cape Town (HREC Reference Number:668/2021)** and will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki, South African Guidelines for Good Clinical Practice and the Medical Research Council (MRC) Ethical Guidelines for Research.

What is this research study all about?

Study Aim

To develop a validated framework of cost-effective, feasible, evidence-based PBM measures to serve as a resource to guide the development of a toolkit that can support PBM implementation in hospitals and assist clinicians in optimising the care of patients and minimising inappropriate blood transfusions.

Objectives

- To conduct a study of the available literature to gain a perspective on the PBM implementation experiences of countries across the globe regarding strategies and tools implemented, challenges and barriers encountered, and outcomes achieved.
- To explore the experiences of PBM champions currently working in or who have previously worked in South African hospitals, to gain their perspectives on the challenges and barriers to PBM implementation in SA, and the essential educational and clinical practice tools needed to support implementation.
- To gain validation through consensus from PBM experts on the essential, feasible, cost-effective, and evidence-based tools appropriate for a South African healthcare-focused PBM toolkit.
- To develop a broad framework as a template to guide the development of a PBM toolkit that can support PBM implementation in SA and beyond, thereby providing clinicians with educational and clinical practice tools to optimise the care of patients.

Why have you been invited to participate?

PBM Champion participants: You have been identified as a participant for this study based on your involvement in creating PBM awareness and your role in implementing PBM principles/measures in your clinical setting. You are therefore invited to share your experiences in terms of successes, challenges, and barriers encountered with implementation of PBM principles in your healthcare environment. You are also invited to share your ideas on what you consider essential, yet cost-effective, feasible, best practice, evidence-based measures needed in a PBM toolkit, appropriate for the South African healthcare setting, to serve as a PBM educational resource guide to support clinicians in optimizing the care of patients and avoiding the inappropriate use of blood transfusions.

PBM Experts for the Delphi Survey: You have been selected to participate in this study based on your PBM knowledge and expertise and your active involvement in leading and guiding PBM implementation.

What will your responsibilities be?

PBM Champion participants: Your responsibility will be to participate in a one-on-one semi-structured interview that will be scheduled as per your availability. The interviews will be recorded so that they can be later transcribed for analysis. The one-on-one interviews will be conducted in person, should COVID-19 regulation permit or by video-conferencing using virtual platforms.

Delphi Survey participants: In the Delphi survey, the researcher asks the same questions of numerous individuals in a precise manner, offering each individual the same set of possible responses. You will be required to rate statements that have been compiled from the responses gathered from the literature and the interviews conducted with the PBM champion participants, in a series of rounds, usually three.

How will you benefit from taking part in this research?

This study provides an opportunity for the study participants to provide their perspectives and expert opinions on PBM implementation strategies and support tools appropriate for South Africa and in doing so you will aid the development of a comprehensive framework for a PBM toolkit. The development of PBM toolkit informed by the framework will serve as a practical educational resource guide for clinicians in supporting and optimizing the implementation of PBM principles.

Are there in risks involved in your taking part in this research?

It is not expected that this study will present with any risks to the participants.

If you do not agree to take part, what alternatives do you have?

N/A

Who will have access to your medical records?

N/A

What will happen in the unlikely event of some form injury occurring as a direct result of your taking part in this research study?

N/A

Will you be paid to take part in this study and are there any costs involved?

No, you will not be paid to take part in the study. There will be no costs involved for you, if you do take part.

Is there anything else that you should know or do?

- You can contact the University of Cape Town Human Research Ethics Committee (HREC) if you have any concerns or complaints that have not been adequately addressed by the researcher. Contact details are:

The Human Research Ethics Committee

E53-Room 46, Old Main Building, Groote Schuur Hospital, Observatory, 7925

Telephone: 021 650 1236. Email: HREC Enquiries <hrec-enquiries@uct.ac.za>

- You will receive a copy of this information and consent form for your own records.

Declaration by participant

By signing below, I agree to take part in a research study entitled ***Developing a validated framework for a Patient Blood Management toolkit appropriate for the South African healthcare context.***

I declare that:

- I have read or had read to me this information and consent form and it is written in a language with which I am fluent and comfortable.
- I have had a chance to ask questions and all my questions have been adequately answered.
- I understand that taking part in this study is **voluntary** and I have not been pressurised to take part.
- I may choose to leave the study at any time and will not be penalised or prejudiced in any way.
- I may be asked to leave the study before it has finished, if the study doctor or researcher feels it is in my best interests, or if I do not follow the study plan, as agreed to.

Signed at (place) on (date)

.....
Signature of participant

.....
Signature of witness

Declaration by investigator

I (name) declare that:

- I explained the information in this document to
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research, as discussed above
- I did/did not use an interpreter. *(If an interpreter is used then the interpreter must sign the declaration below.*

Signed at (*place*) on (*date*)

.....
Signature of investigator

.....
Signature of witness

Declaration by interpreter

I (*name*) declare that:

- I assisted the investigator (*name*) to explain the information in this document to (*name of participant*) using the language medium of Afrikaans/Xhosa.
- We encouraged him/her to ask questions and took adequate time to answer them.
- I conveyed a factually correct version of what was related to me.
- I am satisfied that the participant fully understands the content of this informed consent document and has had all his/her question satisfactorily answered.

Signed at (*place*) on (*date*)

.....
Signature of interpreter

.....
Signature of witness

APPENDIX B: PBM CHAMPION INTERVIEW GUIDE

Participant Name (Optional): _____

Designation (MO, Registrar, Consultant, etc.): _____

Specialty: _____

Hospital: _____ Province: _____

Hospital classification

Secondary/Tertiary/Academic): _____

Department: _____

Date of Interview: _____

Type of Interview (In person/Online): _____

Introduction and overview of the research study, aim and objectives and the interview process.

Title of Research: Developing a validated framework for a Patient Blood Management (PBM) toolkit appropriate for the South African healthcare context.

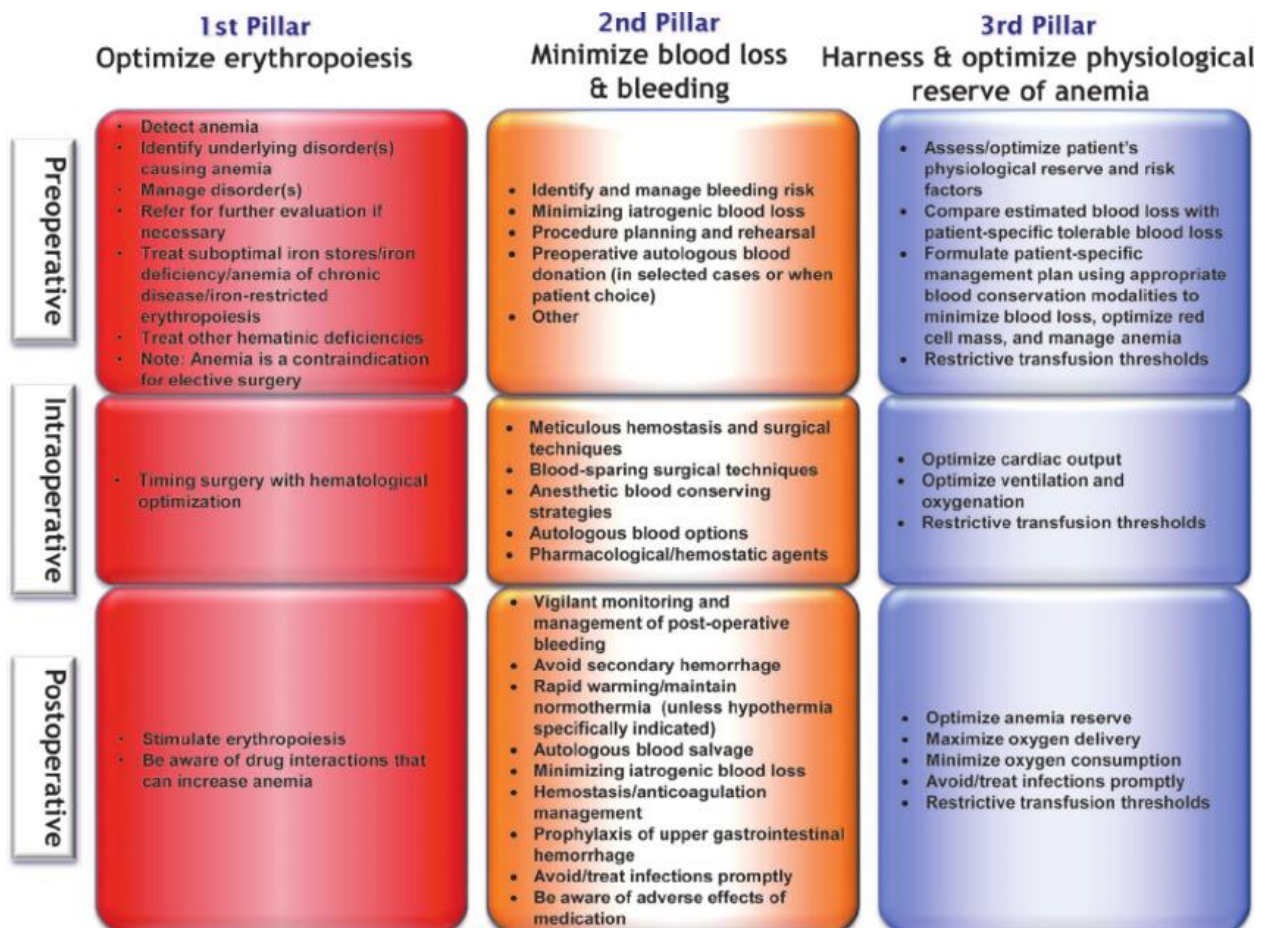
Research question: What are the essential, feasible, cost-effective components needed for a framework to guide the development of a patient blood management toolkit that can support the implementation of PBM practices in South Africa and enable clinicians to optimise the care of patients and minimise inappropriate blood transfusions?

Please answer the following questions

1. Please describe your healthcare environment in terms of Patient Blood Management and its implementation.
 - a. Which elements of PBM have you focused on?
 - b. How would you describe your role in championing PBM in your hospital?
 - c. Can you share some successes related to PBM implementation?
 - d. Why do you believe PBM implementation is important?
2. Do you think a PBM toolkit (on a scale of 1 to 10, 1 being not necessary at all and 10 absolutely necessary) will be helpful in your environment? Please motivate your answer.
3. Please indicate the availability and the extent of usage of the following modalities used in PBM (Extent of usage: frequently used, sometimes used, rarely used, not used at all):

- a. Oral iron
 - b. IV iron
 - c. Erythropoietin
 - d. Surgical theatre activity - use of:
 - Cell salvage
 - Tranexamic acid
 - Other antifibrinolytics
 - Type of anaesthesia
 - e. Point of care testing (POCT): (POCT Haemoglobin/ Haematocrit, POCT INR, POCT Platelet Function, Whole Blood Coagulation Monitoring, Haemostasis Monitor using near patient testing (Rotation thromboelastometry, ROTEM, TEG)
 - f. Optimising anaemia before elective surgery
 - g. Single unit transfusions
 - h. Blood accountability forms
 - i. Any other non-transfusion approaches used
4. Is the usage of blood and blood products monitored or audited in your setting?
- a. Do you believe that monitoring and reporting of blood usage will reduce unnecessary transfusions? If yes: Who should be monitoring and how should the usage be reported?
5. What do you consider to be current barriers and challenges to PBM implementation, in your setting, and overall in South Africa and other low and middle-income countries?
- a. Please comment on the question above with regards to:
 - General challenges
 - Practical challenges
 - Hospital management-related challenges
 - Policy challenges
 - b. Do you have any ideas on how we might overcome these challenges and barriers?
 - c. Can you think of any ways in which a PBM toolkit might be helpful to address these challenges?
6. If you had to develop a PBM toolkit for South Africa, what would you include as the essential, cost-effective, feasible, best practice, evidence-based measures as clinical practice tools with reference to the three pillars of PBM (you can refer to the picture below).
- a. Tools for PBM Pillar 1: Optimise erythropoiesis (All patients with anaemia and managing pre-operative anaemia)

- b. Tools for PBM Pillar 2: Minimize blood loss and bleeding
 - c. Tools for PBM Pillar 3: Optimise tolerance of anaemia
 - d. Tools to create a patient-centred transfusion practice culture
7. Which of the PBM strategies in the diagram would you consider less feasible in your environment and why?



The three-pillar, nine-field matrix of patient blood management. (Designed for the Western Australian PBM project. Used with permission from the WA PBM Project committee)

8. From a day-to-day practice point of view,
- a. what would you find helpful in a PBM toolkit to support you with the elements you would like to include (as mentioned in the question above)?
 - b. what format would you like the PBM toolkit to be in?
 - Physical toolbox containing guidelines, diagrams, educational material, lectures on DVDs, standard operating procedures, etc. OR
 - Digital toolbox with all the above elements, but everything online
 - Both physical and digital

Please motivate your answer.

9. What are the greatest deficiencies in the abilities of healthcare workers (doctors, nurses, etc.) in terms of PBM? Prompting questions below
 - a. On which elements of PBM do you feel further education and training is required and why?
 - Doctors
 - Nurses
 - Others, e.g., management?
 - b. What has been most helpful to you personally in your development as a PBM champion?
10. Do you have any practical suggestions for the implementation of PBM in South Africa that might help inform the framework for a PBM toolkit?
11. Any other comments/suggestions.

Thank you very much for participating in this interview.

Appendix C: Invitation to participate in the Delphi Survey

To:

Dear Dr

My name is Vanitha Rambiritch and I am the Head of Learning and Development at the South African National Blood Service (SANBS). I am a PhD student in the Faculty of Health Sciences at the University of Cape Town (Student number RMBVAN001). My PhD research is titled:

Developing a Validated Framework for a Patient Blood Management toolkit appropriate for the South African healthcare context.

My study Supervisors are Professor Vernon J. Louw: Chair and Head Division Clinical Haematology, Department of Medicine, University of Cape Town, and Professor Estelle Verburgh: Clinical Haematologist and Associate Professor of Medicine. Division of Clinical Haematology, Department of Medicine, University of Cape Town.

Study Aim

To develop a validated framework of cost-effective, feasible, evidence-based PBM measures to serve as a resource to guide the development of a toolkit that can support PBM implementation in hospitals and assist clinicians in optimising the care of patients and minimising inappropriate blood transfusions.

Objectives

- To conduct a study of the available literature to gain a perspective on the PBM implementation experiences of countries across the globe regarding strategies and tools implemented, challenges and barriers encountered, and outcomes achieved.
- To explore the experiences of PBM champions currently working in or who have previously worked in South African hospitals, to gain their perspectives on the challenges and barriers to PBM implementation in SA, and the essential educational and clinical practice tools needed to support implementation.
- To gain validation through consensus from PBM experts on the essential, feasible, cost-effective, and evidence-based tools appropriate for a South African healthcare-focused PBM toolkit.
- To develop a broad framework as a template to guide the development of a PBM toolkit that can support PBM implementation in SA and beyond, thereby providing clinicians with educational and clinical practice tools to optimise the care of patients.

The methods that will be utilised in this study include conducting a comprehensive and critical review of the literature to gain a perspective on PBM measures, tools and overall strategies implemented in countries across that globe. This will include outcomes and successes, challenges and barriers encountered, as well as the required PBM educational needs for clinicians and other healthcare partners. Study of the literature will therefore provide a starting working template for a broad framework of PBM implementation strategies, the required tools and resources, and the necessary PBM educational readiness needs of clinicians for translation into practice.

One-on-one semi structured interviews will then be conducted with PBM champions in South Africa with the aim to design a draft set of criteria in terms of essential, feasible, cost effective, best practice measures a PBM toolkit should comprise and how the elements or care bundles should be packaged for best utility. These criteria will be used to compile a questionnaire that will be pre-tested in a pilot study, before being presented to the members of the Delphi panel.

The semi-structured interview can be defined as a data-collection instrument, which is used to collect data, either by face-to-face or virtual means. In the Delphi survey, the researcher asks the same questions of numerous individuals in a precise manner, offering each individual the same set of possible responses. This study provides an opportunity for the study participants to provide their perspectives and expert opinions on PBM implementation strategies and support tools appropriate for South Africa and in doing so they will aid the development of a comprehensive framework for a PBM toolkit appropriate for the South African healthcare context.

The development of a PBM toolkit informed by the framework will serve as a practical educational resource guide for clinicians in supporting and optimizing the implementation of PBM principles. The associated reduction in healthcare costs and easing of pressure on blood supplies in the country, making blood more readily available for patients in clinical need of this precious resource, are much needed added benefits for South Africa. Such a toolkit will further serve as a measure towards bridging the long-standing transfusion practice knowledge deficiencies amongst clinicians and improving clinical transfusion practices. Ultimately, a validated needs-focused framework for a PBM toolkit will not only benefit South Africa, but also Africa, and other low and middle-income countries (LMICs) wanting to implement PBM programs. It will serve as a meaningful response to WHO's call for a global PBM framework; and a representation of the PBM needs for South Africa and other LMICs.

You have been selected, according to pre-determined criteria, as having expert knowledge and experience in PBM. I, therefore, respectfully request your expert cooperation in participating in this study. I will try to take as little of your time as possible. Completion of the Delphi survey will take approximately 1-2 hours (Round 1), one hour (Round 2), and less than 30 minutes for any subsequent rounds. The Delphi survey, as well as any relevant information or will be e-mailed to you. Should you have any specific questions or queries, my contact details are available below.

Your participation in this study will be highly appreciated.

Kind Regards

Vanitha Rambiritch

Mobile: 0828748261

Email: Vanitha.rambiritch@sanbs.org.za

APPENDIX D: INTERVIEW THEMES

Table 1: Description of PBM Champion Participants

1a. Role in PBM implementation
▪ Advisory and PBM support role (P2, P8, P9, P16) ▪ Steering role (P2) ▪ Active in hospital transfusion committee (P4, P6, P7, P10, P11) ▪ Education (P1, P2, P6, P8, P9, P11, P12, P13, P14, P15) ▪ Research (P1, P13, P15, P16)
1b. Interventions implemented or currently implementing
▪ PBM program start-up (P7) ▪ Better anaemia management in children (P3) ▪ Audit of blood usage (P4, P5, P7, P10, P12, P13, P14) ▪ Avoiding unnecessary cross-matches (P4) ▪ Reducing unnecessary transfusions (P13, P15, P16) ▪ Blood users committee/hospital transfusion committee (P4, P6, P7, P10, P11) ▪ Preventing blood wastage (P7) ▪ PBM in cardiac surgery (P13, P16) ▪ PBM in orthopaedics (P13) ▪ Cell-saving (P12, P13, P15) ▪ Cost-saving (P4, P5, P7, P13) ▪ PBM guidelines (P2, P7, P12, P14) ▪ Better management of iron deficiency anaemia (P1, P3, P5, P9) ▪ Microbleeding (P1, P3, P15) ▪ PBM Pillar 3 (P7) ▪ Perfusion strategy (P13) ▪ Perioperative focus (P11) ▪ Post-operative patient care (P15) ▪ Post-partum haemorrhage and maternal health focus (P3, P5, P8, P9) ▪ Correcting pre-operative anaemia (P6, P11, P13, P16) ▪ Single unit transfusions (P10) ▪ Transfusion triggers (P1, P4, P7, P10, P15)
1c. Successes achieved
▪ Better awareness of PBM (P8, P11) ▪ Accountability for blood usage (P7, P13) ▪ Cost-saving for the hospital (P7, P11) ▪ Electronic system created for blood monitoring (P7) ▪ Improved obstetric care (P8, P9) ▪ Access to IV iron P1, P5, P6) ▪ More iron infusions (P3, P5, P11) ▪ Implementation of massive transfusion protocol (P10) ▪ Better patient care (P3, P8) ▪ PBM group created in the department (P16) ▪ Improved pre-operative anaemia management (P6, P8, P11) ▪ Rational blood use (P3, P4, P6, P7, P11, P12) ▪ Restrictive transfusion triggers (P1) ▪ South African Society of Anaesthesiology (SASA) PBM guidelines published (P11, P15) ▪ Support for PBM by hospital management (P7) ▪ Surgeons have come on board (P3)

1d. Motivation for implementing PBM practices

- Understanding the adverse effects of transfusion (P4, P5)
- Learning that PBM is a better way of practising medicine (P2, P4, P9, P15)
- Opportunity to make a difference in healthcare (P3, P9)
- Encouraged through PBM information-sharing webinars (P1)
- Inspired by a leading PBM champion (P1, P3, P5, P7, P8, P10, P16)
- Association with like-minded people wanting to better care for patients (P7, P10, P15, P16)
- PBM literature (P4, P9, P15)
- PBM giants & mentors (P3, P10, P15)
- Postgraduate diploma in transfusion medicine study program (P14)
- Social media chat group (Sub-Saharan Africa PBM WhatsApp group) (P1, P6, P8, P10, P16)

Table 2: Importance of implementing PBM in South Africa and the value of a PBM toolkit

2a. Importance of PBM implementation in South Africa

- It is a holistic healthcare approach (P1, P8, P16)
- It is a quality improvement healthcare approach (P2, P4, P6, P9, P10, P11, P16)
- It can improve the healthcare of the nation (P1, P5, P11)
- It is based on patient-focused outcomes (P5, P9, P10, P11, P16)
- Protects patients' rights & safety (P2, P6, P9)
- It supports a preventative care paradigm (P2, P5, P8, P9, P10)
- It will improve women and children's health (P5, P8, P13)
- It is a practical approach to address the high prevalence of anaemia (P5, P8, P9, P10, P11)
- It offers opportunity for early detection & correction of anaemia (P5, P8, P9, P10, P11)
- It would make doctors more vigilant about their clinical approach to anaemia prevention and treatment (P13)
- PBM is not only about surgery, it has a wide healthcare reach (P1, P16)
- It is an opportunity to change mindsets of doctors in treating anaemia (P4, P7, P16)
- It is an approach to conserving donor blood which is a scarce resource (P5, P6, P9, P11, P12)
- It encourages rational blood use, thus preventing unnecessary transfusions (P10, P11, P13)
- It can reduce morbidity & mortality (P5, P9)
- It is a means to avoid and reduce transfusion adverse effects (P13)
- Encourages research-driven improved clinical practices (P16)
- It offers financial benefits to patients and the healthcare system (P6, P9, P11, P13)

2b. Value of a PBM toolkit in PBM implementation

A PBM Toolkit will:

- Help jumpstart PBM implementation in South Africa (P2)
- Serve as a driver to align clinical practices to the pillars of PBM (P2, P7, P13)
- Make PBM practically doable (P2, P7, P11, P13, P15)
- Serve as a quality improvement approach to patient care and overall healthcare (P7, P13)
- Enable empowerment of healthcare workers by creating better awareness and improved knowledge of PBM (P3, P13)
- Serve as an educational platform for continuous medical education (P15)
- Encourage clinically appropriate practices (P2, P13)
- Provide guidance and support for junior doctors (P5)
- Provide quick guidance and support; this is needed in a time constraint working environment (P6)
- Encourage accountability in clinical decision-making (P14)

- Help change the historic culture of inappropriate transfusion practices (P8, P13)
- Encourage the use of blood conserving approaches (P5)
- Guide application of evidence-based practices (P16)
- Help reduce morbidity & mortality (P5)
- PBM implementation is achievable in South Africa; a toolkit can help achieve this (P1, P3, P7, P8, P9, P16)
- Implementation of PBM Pillar 1 and tools to guide what needs to be done is a major need; that is good enough for South Africa (P1, P3, P4, P7, P9, P12)

Table 3: Barriers and challenges to PBM implementation in South Africa that need to be addressed

3.1 GENERAL CHALLENGES

a. Lack of PBM awareness, education and buy-in

- Lack of PBM knowledge and awareness amongst healthcare workers across all settings (primary to tertiary healthcare levels) (P3, P4, P5, P8, P6, P9, P11, P13, P16, P14, P15)
- Not enough being done to improve awareness of PBM amongst healthcare workers (P11, P14, P16)
- Awareness talks and initiatives attract the same individuals who are already aware of PBM (P13)
- Awareness reach is not wide enough to reach all stakeholders (P3, P4, P13, P16)
- Lack of PBM awareness amongst general practitioners (GPs) yet the GP environment is ideal for early detection and correction of anaemia (P12)
- Nurses often excluded from PBM talks and interventions, yet they have a key role to play in PBM (P5, P8, P9, P10, P11, P13, P16)
- PBM awareness in primary healthcare clinics is very poor, yet it is the ideal environment for early detection and correction of anaemia, including early referral (P2, P3, P5, P6, P10, P13, P15)
- Community health workers not educated on PBM; they are ideal partners to appropriately educate communities on anaemia prevention and general self-care (P5, P6, P10, P13, P14, P15)
- Little or no focus on PBM during internship training of doctors (P14)
- Lack of PBM awareness, guidance and support for doctors at all levels in hospitals (P12)
- Limited access to advisory support from haematologists in private and public sectors (P14)
- PBM not formally endorsed by important stakeholders such as Department of Health, South African Medical Association, medical aids/insurance funders. Uptake is therefore poor (P1, P11, P13)
- Lack of buy-in and support from senior leadership in hierarchical structures within hospitals (P6, P8, P10, P11, P15)
- Surgeons not on board with PBM, yet they are big users of blood (P4, P6, P8, P10, P15)
- Private hospitals not willing to get on board with PBM (P13, P14)

b. Culture of practice amongst doctors

- Longstanding historic practice of prescribing blood transfusions for treatment of anaemia persists (P3, P4, P5, P7, P8, P10, P13, P15)
- Access to blood is easy; it is therefore an overused quick fix to correct anaemia (P1, P3, P4, P10, P12)
- Doctors are overworked dealing with high patient numbers in public hospitals. Transfusion therefore often becomes the quickest and easiest approach to correct low haemoglobin levels (P1, P7, P11, P10)
- Focus is still on 'product' rather than 'patient' (P1)
- Doctors chase numbers when it comes to haemoglobin levels (P10, P13, P15)
- Transfusion triggers vary amongst clinicians within the same discipline (P13, P15)
- Single unit transfusions (transfuse and assess) in non-bleeding patients is not a culture of practice in most settings (P12)
- Lack of multidisciplinary approach to patient care (P1, P3, P8, P9, P10, P13, P16)

- Lack of surgical capability in district hospitals – Patients have to be referred causing delays in treatment (P4, P6)
- Some consultants leave junior doctors without support (P6, P12, P16)
- Private healthcare doctors are not accountable and not open to being told what to do (P9, P14)
- Ego of doctors; making practice changes difficult (P4, P8, P11, P12)

c. Finance-related challenges

- Inadequate budget for laboratory screening tests - Anaemia goes undetected in primary healthcare facilities and district hospitals preventing early treatment (P1, P5)
- Silo budgets - Separate laboratory budget, blood budget, pharmaceutical budget etc. This hinders good practices due to administrative controls (spending a little more on the laboratory or pharmaceutical (e.g., iron) budget can result in savings in the blood budget) (P1)
- Gatekeeping challenges restrict ordering of blood tests (P5, P14)
- Insufficient funds to purchase point-of-care testing devices (P5, P6)
- Inadequate budget to cover cell salvage equipment and consumables costs (P8)
- Thromboelastography (TEG) – expensive to run tests (P10)
- Not enough budget to employ more hospital staff. Current staff are already overworked with little motivation to do more than they can (P4, P11).
- PBM is perceived as overwhelming; it is more work for doctors (P3).

d. Capacity – Manpower challenges

- No transfusion practitioners in hospitals (P1)
- No dedicated PBM nurses (P1, P6)
- Not enough PBM champions (P1, P3, P5)
- No transfusion medicine specialists in South Africa (P1)
- Not enough staff to run pre-operative anaemia clinics (P1)
- Lack of time to review blood accountability forms and monitor blood usage (P1, P9, P11)
- Backlog of surgical cases - Cannot delay surgery to optimise anaemia (P13)
- Doctors spending time on administrative tasks due to lack of administrative support in public healthcare sector (P5, P7)

e. Anaemia disease burden

- High anaemia prevalence in South Africa makes it an 'accepted' as a norm (P15)
- Anaemia is often underdiagnosed or undetected (P5, P8, P9, P10, P11, P14)
- Not enough priority is given to treating the causes of anaemia (P12, P14)
- Poor prioritization of anaemia in non-surgical patients (P12)
- Inappropriate treatment - oral iron and not blood transfusion should be first treatment modality iron deficiency (P5)
- Oral iron is not always well tolerated by some patients - more tolerable iron preparations come at a higher cost (P5, P14, P15)
- Patients not educated on anaemia and how to take oral iron (P14)
- Pre-operative anaemia optimisation is not a routine practice in hospitals (P13, P16)
- Oversampling of patients and unnecessary repeat blood tests contribute to anaemia in hospitalised patients (P15)
- Use of smaller volume blood collection tubes practical for laboratory analysis is limited/non-existent (P5, P6, P11, P15)
- Primary healthcare facilities under-resourced for early detection and correction of anaemia (P8)

▪ Lack of staff, training, access to laboratory testing, inadequate stocks of oral iron, B12 injections (inexpensive PBM modalities) in some facilities (P4, P5, P8) ▪ District hospitals not adequately geared for anaemia detection and management (Lack of staff, laboratory testing limitations) - these place a burden on tertiary facilities when patients end up with complications (P4)
f. Department of Health-related challenges ▪ Silo culture of health departments in the various provinces causing regional disparities (P1, P5, P7, P9, P11, P14) ▪ Lack of national policies/protocols to guide practices (P1, P9, P11, P14) ▪ Not enough attention is given to the clinical significance and impact of anaemia in the South African population (P15) ▪ Poverty in society contributing to dietary insufficiencies contributing to the anaemia burden (P8) ▪ Most patients access only primary healthcare facilities which are not optimally functional/resourced to apply PBM principles (P6)
g. Patient-focused challenges ▪ Lack of patient-centred healthcare culture (P1, P11) ▪ Patients not empowered and educated (P1, P3, P5) ▪ Patients not referred early enough – they arrive at tertiary facilities very complicated (P4, P 14) ▪ Lack of proper informed consent process for transfusion (P1, P10, P12) ▪ Patients exposed to risks - blood requisition forms do not ask whether treatment options other than transfusion have been considered for patients (P3) ▪ Lack of patient protection -blood requisition forms do not ask for reasons why blood is being ordered for patients; no motivation needed for ordering blood (P3)
3.2 Practical challenges
a. Infrastructure challenges ▪ Lack of space and infrastructure to set up anaemia clinics (P7, P10, P11, P15) ▪ Absence of/dysfunctional computer systems and information technology support for access to laboratory results (P14) ▪ Absence of electronic blood ordering systems which can create alerts/warnings preventing unnecessary blood ordering (P10) ▪ No linked computer systems between hospitals and blood banks (P10, P12, P14) ▪ Lack of hospital monitoring systems for blood usage – hospitals depend on Blood Services for blood usage data (P10, P12) ▪ Lack of ambulances contribute to delays in transferring patients with bleeding and blood loss to secondary/tertiary facilities (P4)
b. Lack of general PBM resources/modalities in hospitals ▪ Haematinics in primary healthcare facilities are not always available (P13) ▪ No blood warmers in most hospitals (P2) ▪ Lack of cell salvage equipment (P5, P10, P15) ▪ Consumables for cell salvage not available (P10) ▪ Oral iron stocks run out (P15) ▪ IV Iron access and motivation processes are tedious in private healthcare sector (P1, P2, P3, P14) ▪ Lack of comfort with IV iron use (P7) ▪ Lack of validated devices for point-of-care testing (P14) ▪ TEG not available in theatres (P9, P10)

Tranexamic acid not available in some hospitals (P2)
3.3 Policy challenges
- Not enough policies to guide best practices (P1, P10, P11) - Lack of national policies (P1, P9, P11, P14) - Absence of transfusion practice guidelines in national core standards (P2) - Access to policymakers to endorse policies is a challenge (P1) - No guideline on how to create, change, or review policies (P1) - Fragmented policies – no standard blood transfusion policy in hospitals (P14) - Poor/slow implementation of protocols/policies (P6, P11) - Systems for monitoring compliance to policies is lacking (P9) - Lack of clear guidance on anaemia management in primary, secondary, and tertiary healthcare settings (P12) - Lengthy guidelines - Simple stronger policies needed (P4, P7) - Lack of multidisciplinary collaboration for policy development (P1, P16) - Challenges getting timeous endorsement of policies by Department of Health (P1, P10, P14) - Hospital policies should not be led Blood Services (P10)
3.4 Hospital-management-related challenges
- Lack of buy-in and support (P4, P5, P6, P10, P11, P15) - No accountability measures for irrational use and wastage of blood and blood products (P1, P12, P14) - Blood user committees are either non-existent or not adequately functional (P10) - Time challenges including poor commitment from some blood user committee/hospital transfusion committee members (P4, P10) - Blood transfusion accountability forms are not used in all hospitals (P2, P6)

Table 4: Auditing and monitoring of blood and blood product usage

4a. Should usage of blood and blood products be monitored?
Yes (P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P12, P13, P14, P15, P16)
4b. Benefits of monitoring blood usage
- Identify blood utilisation patterns and trends (P1, P4, P5, P7, P10, P13, P14) - Opportunity to correct poor blood ordering practices and provide justification for practice (P3, P5, P7, P13) - Opportunity to educate, inspire, and motivate (rather than punish) (P3, P4, P5, P7, P10, P11, P13) - Create PBM awareness and instil rational blood usage (P1, P3, P11, P16) - PBM cannot be implemented without audit and monitoring (P1)
4c. Who should monitor the usage of blood and blood products?
- Blood Services (P4, P16) - Hospital management (P2, P4, P6, P8) - Dedicated transfusion practitioner appointed for the hospital (P1) - Appointed transfusion/ PBM nurse (P1, P16) - Blood Users committee/Hospital transfusion committee (P1, P4, P5, P6, P7, P10, P11, P13, P14) - Heads of each Department (P4, P5, P6, P7) - Department of Health (P2)

Table 5: Availability and usage of various PBM modalities

	Frequently /Commonly used	Sometimes used	Rarely used	Never used	Comments
Oral iron	P1, P2, P3, P4, P5, P6, P7, P8, P19, P11, P12, P13, P14, P15	P2 “Sometimes out of stock”			Commonly used across public and private healthcare
IV Iron	P3, P5, P6	P10, P11, P13, P8	P1, P2, P7, P9, P15	P16.	IV iron was noted as frequently used in private infusion clinics.
Erythropoietin	P1, P3 (Used in Renal units)	P4, P14, P15	P1, P2, P8, P11, P13	P6, P7, P8, P10, P12, P16	Erythropoietin was noted as commonly used in Renal units
Tranexamic acid	P4, P5, P6, P7, P8, P10, P11, P13, P14				Commonly used across public and private healthcare
POC (TEG & ROTEM)	P4, P11, P12, P13, P14, P15, P16	P2, P7, P9, P10	P2, P9	P5, P6	Commonly used in private healthcare and in tertiary public healthcare facilities POC testing other than TEG & ROTEM was rarely used in private healthcare
POC Haemoglobin	P1, P4, P5, P10, P11, P15, P16,	P6, P7			Used mainly in public healthcare facilities. POC testing other than TEG & ROTEM rarely used in private healthcare
POC-INR			P5	P4, P6, P11	Not commonly used in both public and private healthcare
POC-Platelet function		P11		P2, P6	Not commonly used in both public and private healthcare
POC- Blood gas	P4, P7, P10, P13, P16				Used in public healthcare facilities
Optimising anaemia before surgery	P3, P5, P14	P1, P6, P8, P10, P11,	P2, P9	P2, P7	Not a common practice in both public and private healthcare
Single unit transfusions	P16	P1, P4, P6, P7, P11	P1, P2, P5, P8, P12	P1	Sometimes used in some public healthcare

					facilities never used in private healthcare
Blood accountability forms	P2, P4, P7, P13	P1, P2, P6		P5, P12	Blood accountability forms were used in some public healthcare facilities and never used in private healthcare
Cell salvage	P5, P6, P15	P4, P10, P14		P7	Commonly to sometimes used in Private Healthcare Commonly used, sometimes used to never used in hospitals in public healthcare
Type of anaesthesia	P5, P8, P11, P13, P15, P16	P6, P7,			Surgical consideration mainly in tertiary level and private hospitals
Other modalities					
Microbleeding/ microsampling	P3			P9, P11	Micro-bleeding practice reported in one private healthcare facility. Never practiced in public healthcare.

Table 6: Tools for a PBM Toolkit (Policies/Procedures/Protocols/Educational material etc.)

6.1 ANAEMIA FOCUS TOOLS
a. Fundamental anaemia detection and management tools - Anaemia detection algorithms/flowcharts (P2, P3, P4, P5, P8, P9, P10, P11, P14) - Flowcharts for selection of the appropriate laboratory tests (When to order what tests?) (P1, P2, P3, P5, P7, P9, P11, P14, P15) - Identifying the underlying causes of anaemia (P11, P14) - Treating the underlying causes – anaemia management algorithms with scenarios wherever possible (P3) - List of drugs that cause anaemia (P7) - Guidelines for when to refer patients to the Haematologist (P10, P14) - Guidelines for when to refer patients to the Gastroenterologist (P10, P14) - Guidelines for when to refer patients to the Gynaecologist (P10, P14) - Guideline for anaemia-related cancer screening (P14)
b. Iron deficiency - Advocate the following:

- Perform routine serum ferritin tests on patients (P3, P5)
- Emphasis on the importance of iron studies (P3, P5)
- Fasting samples must be drawn for reliable iron study results (P1)
- Prescribing oral iron – How and when it should be taken (P5, P8, P16)
- Indications for intravenous (IV) iron (P1, P6, P9)
- Administration and monitoring of IV iron infusions
- Follow-up of patients on iron therapy (P8)

c. HIV-related anaemia (*Adapted from the literature*)

- Simplified diagnostic approach to anaemia in HIV-infected individuals.
- Risk factors associated with anaemia in HIV infection (*history of clinical AIDS, CD4 cell count of 200 cells/ml, plasma viral load, women, Zidovudine use, increasing age, lower body mass index, history of bacterial pneumonia, oral candidiasis, history of fever*).
- The major causes of HIV-related anaemia.
- Drugs that commonly cause myelosuppression in HIV-infected patients.
- Identify and correct the treatable causes of anaemia in HIV-infected patients.
- Manage anaemia of inflammatory disease (previously termed anaemia of chronic disease) as a cause of HIV-related anaemia.
- Vigilance in the treatment of opportunistic infections that can lead to anaemia.
- Malignancies that can lead to anaemia
- Current treatment guidelines for anaemia in HIV-infected persons.
- Use of HAART (Highly Active Antiretroviral Therapy)- the impact of various HAART regimens on anaemia.
- Anaemia in the HIV population should never be regarded as "normal" and a patient who continues to be anaemic after effective ART should be investigated for other causes of the anaemia.
- Use of Recombinant erythropoietin such as erythropoietin alfa.
- Considerations for blood transfusion in patients with HIV-related anaemia.
- 30% of patients living with HIV can have a positive Coombs test. Positive Coombs test makes crossmatching difficult so that only the "least incompatible" blood can be issued. The importance of weighing the risk of transfusing "least incompatible" needs to be considered

6.2 Tools for complete care paradigm for women

- Guidelines for monitoring iron levels in obstetric patients (P3)
- Management of iron deficiency anaemia and iron deficiency in obstetric patients (P5)
- Checking iron levels 6 weeks postpartum (P3)
- Post-operative iron protocol for Caesarean sections (P15, P16)
- Guideline for PBM in obstetric bleeding emergencies and Postpartum haemorrhage (P6, P7)
- Checking iron levels following treatment of anaemia caused by heavy menstrual bleeding (P3)
- Referral of patients for further anaemia workup (P4, P14)

6.3 Tools for minimising iatrogenic blood loss

- Microsampling/microbleeding (smaller volume blood sample collection) (P1, P3, P15)
- Avoiding unnecessary repeat laboratory testing (P3, P15)
- Point-of-care (POC) coagulation testing (P1, P3, P6, P10, P13, P15)
- How to use point of care equipment (Do's and Don'ts) (P1, P3, P13, P15)
- TEG protocol (P9, P13, P15)
- Patient and healthcare benefits of POC testing

6.4 Tools for pre-operative, intra-operative and post-operative patient care

- Pre-operative anaemia optimisation (P1, P2, P3, P5, P9, P11, P15, P16)

- Management of iron deficiency anaemia in surgical patients (Pre-op, intra-op and post-op) (P3, P5, P8, P9, P10, P16)
- Screening for high-risk patients (P15)
- Flagging high-risk patients and follow-up (P15)
- Coagulation management (P1, P6, P7)
- Managing patients on anticoagulant / anti-platelet therapy (P14)
- Bleeding assessment tools (P1, P6, P7, P9, P11)
- Bleeding management tools (P1, P6, P7, P9, P11)
- Massive bleeding protocol (P2)
- Trauma-associated haemorrhage (P4, P10)
- Cardiac surgery-associated haemorrhage (P13)
- General surgical considerations (haemostasis, lowering blood pressure, normothermia) (P6, P11)
- Meticulous haemostasis and surgical techniques (P6, P11)
- Blood sparing surgical techniques (P7, P8, P15, P16)
- Blood conserving approaches (P14, P16)
- Anaesthetic blood conserving strategies (P7, P8)
- Indications and contra-indications for intraoperative/ postoperative autologous blood collection and re-transfusion (P1, P4)
- Pre-operative autologous donation (P1, P4)
- Cell salvage videos (P1, P6, P11, P16)
- Blood loss formula app for predicting blood loss (P7)
- List of medications that cause bleeding (P11)
- Limiting dilutional coagulopathy - Guidance on crystalloid use – dangers of overuse (P6)
- ERAS Concept (Early recovery after surgery) – Early post-operative feeding instead of using upper GI haemorrhage prophylaxis (P4)
- Use of erythropoietin (P1, P3, P10)
- Use of antifibrinolytic agents (aprotinin)
- Use of tranexamic acid (P10, P11, P13)
- Optimize cardiac output (P13)
- Optimize ventilation and oxygenation (P11, P15)
- Optimize anaemia reserve (P2, P7)
- Maximize oxygen delivery (P11, P15)
- Minimize oxygen consumption (P11,15)
- General post-operative patient care guidelines (P8, 16, P11)
- Vigilant monitoring and management of post-operative bleeding (P15, P16)
- Preventing secondary postoperative haemorrhage (P6, P7)
- Avoiding/treating infections promptly (P8, P16)

6.5 Transfusion decision-making tools

- Blood ordering, product indications and blood usage (P6, P14)
- Discipline-specific PBM/transfusion guidelines (P6)
- Products, services and testing offered by the blood services (P6, P12, P14, P15)
- Transfusion risks and hazards (P9)
- Cost of blood and blood products, including surcharges and levies for emergency and out-of-hours testing and services (P6)
- Restrictive transfusion thresholds (P6, P7, P14, P15, P16)
- Single unit transfusion focus – transfuse and assess strategy (P1, P4, P6, P7, P8, P11)
- Blood ordering and management at hospitals with no onsite blood banks (P14)

6.6 Tools to assist hospitals in setting up PBM programs

- Guidelines for setting up healthcare setting appropriate PBM program (P10)

▪ Self-audit guidelines and checklists (P8, P13, P14, P15) ▪ PBM readiness checklists for hospitals (needs assessment) (P8, P13, P14, P15) ▪ Setting metrics/targets – Measures to determine whether PBM targets are being met (P10) ▪ Transfusion control measures – monitoring systems to ensure patients are transfused only when clinically necessary (P6, P7, P14, P15, P16) ▪ PBM checklist to assess patients e.g., <i>Has the patient had a full blood count in the last six weeks, has the patient had an iron study, does the patient have the following symptoms, did the patient bleed intraoperatively? How much do you think the patient bleed? Postoperative bleeding?</i> (P8, P13, P14) ▪ Easy access templates for hospitals to write their own PBM-related protocols (P10) ▪ Templates for patient history taking (P14) ▪ Templates to identify bleeding risk (P1, P6, P7, P9, P11) ▪ Laboratory tools – Algorithm to request tests for bleeding disorders (P5, P9, P14) ▪ Laboratory tools – Algorithm to request tests for detection of anaemia (when to request what tests) (P5, P9, P14) ▪ Laboratory awareness tools - What do elevated/decreased test results mean (P5, P9, P14) ▪ Guidance on how to set up pre-operative anaemia and bleeding clinic (P1, P11) ▪ Referenced literature providing evidence base for PBM implementation in South Africa, LMICs and globally (P15) ▪ How to set up hospital transfusion committee/blood user committee/PBM committee (P1, P2) ▪ Standing hospital transfusion committee/blood user committee/PBM committee meeting agenda templates (P1, P2) ▪ Hospital transfusion committee/blood user committee/PBM committee representation guidelines (P1, P2) ▪ Blood Accountability forms (P10, P11) ▪ Comprehensive informed consent documents (P12, P14) ▪ Code of conduct for ordering and administering transfusions (P1) ▪ Audit tools (How to carry out an audit e.g., transfusion use, transfusion reactions, iron reactions. (P10) ▪ Implementing electronic blood ordering systems (P10)
6.7 Tools for creating a patient-centred culture ▪ Information campaigns by healthcare workers/healthcare organizations (P2, P11, P12, P13) ▪ Radio power (P13) ▪ Social media platforms (P11) ▪ Information booklets in healthcare facilities (P6) ▪ Patient empowerment talks (P2, P5, P9, P11, P12, P13) ▪ Doctors making time to talk to their patients (P5) ▪ Language-appropriate information booklets for patients in rural communities (P3, P13) ▪ Medical aids/insurance funders serving as a voice to educate patients (P2) ▪ Patients empowering fellow patients with information (P1) ▪ Digital education app for patients (P1) ▪ Videos and posters in waiting rooms (across primary, secondary and tertiary facilities) (P3) ▪ Community healthcare workers providing education in the respective communities (P6, P10, P14, P15) ▪ Share patient stories and experiences (eventful and uneventful) (P9) ▪ Online education e.g., YouTube type videos (P3)
6.8 Other general tools ▪ Blood ordering form - include questions on whether alternate approaches other than transfusion have been considered for the patient (P3, P12) ▪ Blood usage/monitoring dashboard where clinicians could log in to a common portal and view blood usage across hospitals (P10, P11) ▪ Share PBM success stories (local and beyond) (P15) ▪ Questions and Answers app (Q&A) (P6) ▪ Digital tool to motivate for IV iron to funders (P1, P2, P5) ▪ Information alerts informing practice changes with updates in protocols/procedures (P1, P8)

Table 7: PBM Toolkit look and feel (How the toolkit should be made available)

Toolkit look and feel
▪ All-inclusive package including videos, diagrams, lectures/podcasts, policies, procedures, templates, etc. (P1, P3, P13) ▪ Digital / electronic toolkit with all of the above (P1, P2, P4, P6, P7, P9, P10, P13, P14, P15, P16) ▪ Physical/Paper based toolkit with all of the above (P1, P2, P4, P6, P7, P9, P10, P13, P14, P16) ▪ Should be a combination of Digital and Physical (P3, P5, P11, P15, P16) ▪ Should be in poster format (P3, P11, P15) ▪ There should be separate toolkits for public and private sector hospitals (P14) ▪ PBM Toolkit specific for nurses (P11, P12)

Table 8: PBM educational needs for doctors and nurses

8.1 Educational Needs for Doctors and Nurses	
a. General aspects of PBM ▪ PBM definition and benefits (P2, P5, P12) ▪ PBM Pillars – What do they mean and how to apply them (P2, P8, P15) ▪ Multidisciplinary care paradigm (P1, P3, P9, P13) ▪ Knowledge of haemostasis (P13) ▪ Role of the nurse in PBM and importance of role empowerment (P1, P2, P3, P5, P7, P8, P11) ▪ Role of the laboratory in PBM (P3, P5, P8, P9) ▪ Management and optimal use of resources in resource constraint healthcare settings (P16)	b. Anaemia ▪ Anaemia is treatable (P1, P7, P8, P16) ▪ Approaches to early detection and treatment (P9, P15) ▪ When to order what laboratory tests (P3, P5, P8, P9) ▪ Understanding laboratory test results (P3, P5, P8, P9) ▪ Consequences of anaemia (P5, P8) ▪ Medications that cause anaemia (P11) ▪ Impact of iron deficiency and anaemia on women and children (P3, P5, P7, P8, P16) ▪ Managing obstetric emergencies (P11) ▪ HIV-related anaemia
c. Oral iron and IV iron ▪ Oral iron and IV iron – When to administer what (P3, P5, P6, P9) ▪ How to take oral iron (e.g., dosing and scheduling) (P5, P8, P13, P14) ▪ Follow-up of patients on oral iron (P3, P14) ▪ Iron metabolism – Role of hepcidin in iron absorption (P11) ▪ IV iron myths – demystify use (P1, P9) ▪ IV iron – Dosage and administration (P6) ▪ IV iron- Preventing and managing adverse events (P9)	d. Blood Banking ▪ Knowledge of blood and blood products and their indications (P4, P14) ▪ Blood ordering – When to order what products (P6, P12, P14, P15) ▪ Blood transfusion should not be the first-choice treatment for anaemia (P5, P11, P14, P16) ▪ Cost of blood and blood products (P6) ▪ Cost of testing (Various crossmatch types) including out-of-hours levies/surcharges (P1) ▪ Blood wastage - Blood Service and health service implications (P4, P5, P8, P12) ▪ Ordering blood on a returnable basis (BRB) benefit (P4) ▪ Appropriate storage of blood and blood products (P14) ▪ Appropriate use of blood and blood products (P11, P14, P15, P16)

e. Ethical aspects ▪ Ethical imperative for PBM (P1, P11, P12) ▪ Ethical aspects of the use of blood and blood products (P1) ▪ Process for informed consent (P4, P12, P14) ▪ Doing enough and what is best for patients – Patient-specific considerations (P1) ▪ Autonomy and patients' rights (P12) ▪ Medico-legal implications of inappropriate anaemia management (P12) ▪ Taking the time to give patients appropriate clinical advice (P5) ▪ Making time for patient education and empowerment (P5)	f. Clinical aspects ▪ Clinically appropriate transfusion decision-making (Moving away from knee-jerk reactions to more informed approach) (P11, P14, P15, P16) ▪ Transfusion risks and hazards (P5, P6, P8, P9, P10, P11, P14) ▪ Restrictive transfusion thresholds (P6) ▪ Adequate assessment of patients – Taking proper history is key for PBM (P8) ▪ How to administer and monitor blood transfusions (P14) ▪ Four-hour rule (transfusion should not exceed four hours from start of the infusion) (P6) ▪ Early patient referrals (P4) ▪ Single unit transfusions (P5, P11, P15)
g. Surgical aspects ▪ Pre-operative, intra-operative and post-operative patient care (P8, P15, P16) ▪ Pre-operative anaemia optimisation (P1, P5, P10, P11, P14) ▪ Timing surgery – When to delay surgery (P3) ▪ Use of tranexamic acid and other fibrinolytic agents (P10, P11, P13)	h. Preventing iatrogenic blood loss ▪ Taking smaller volume blood samples for laboratory testing (micro sampling/microbleeding) (P3, P11, P13, P15) ▪ Avoiding unnecessary repeat testing (P8) ▪ Benefits of Point of care (POC) Testing (P3, P13) ▪ TEG & ROTEM use and interpretation (P9, P13, P15)
i. Blood conservation ▪ Alternate approaches to anaemia management other than transfusion (P3, P4, P5, P6, P7, P13, P15, P16) ▪ Autologous transfusion options (P5, P6, P15) ▪ Cell salvage (P5, P15)	
8.2 Hospital-management education needs	
▪ Role of management in PBM (P2, P7, P8) ▪ Financial outcomes – cost-saving benefits associated with PBM (P5, P7, P11, P13, P15) ▪ Cost comparisons – Blood and Blood products versus alternative approaches to treatment of anaemia(haematinics, pharmacological agents) (P3, P4, P5, P13, P15, P16) ▪ Anaemia is treatable (P8) ▪ Benefit to patients (P1, P11, P13, P15) ▪ Benefits to communities (P1, P11) ▪ Importance of ensuring availability of haematinics (P4) ▪ Importance of ensuring availability of pharmacological/haemostatic agents (P4) ▪ Management role in creating and sustaining improved health culture (P2, P7, P8)	
8.3 Educational needs for patient empowerment	
▪ What is anaemia (P3, P9, P11, P14) ▪ Iron deficiency (P3, P9, P11) ▪ Consequences of anaemia (P11) ▪ How to look out for anaemia (P3) ▪ How to take oral iron (P3, P11, P14) ▪ Consequences of anaemia in pregnancy (P11, P14) ▪ Consequences of anaemia in children (P11, P14) ▪ Basics of blood testing and blood results (P3) ▪ Autonomy and patients' rights (P10, P12) ▪ General health awareness and ownership of health (P5, P9, P11, P13) ▪ Importance of seeking guidance from the right people – requesting advice (P10)	

- Change mindset “Doctor always knows best philosophy” (P3, P5)
- Informed consent for transfusion (P1, P10, P12)
- Risks of transfusion (P9)
- Alternative treatment options for anaemia other than transfusion (P3, P8, P14)
- Options for patients who refuse transfusions (P10)

Table 9: Suggestions for PBM implementation in South Africa

Suggestions for the implementation of PBM (What needs to happen)
▪ Collaboration and buy-in from all stakeholders (all departments, doctors, nurses, hospital management, blood services, medical aids, department of health) (P2, P3, P5, P8, P9, P10, P11, P14, P15, P16) ▪ Hospital management and leadership support (P5, P9, P10, P11, P14) ▪ Endorsement of PBM by key stakeholders (Department of Health, South African Medical Association, medical aids/insurance funders, etc.) (P2) ▪ Private healthcare must get on board (P13, P14) ▪ Create PBM awareness amongst all partners (P3, P4, P5, P8, P9, P10, P11, P13) ▪ PBM Education for doctors, nurses and administrators (P1, P7, P8, P9, P15) ▪ Mandatory education programs for doctors before they can transfuse patients (P16) ▪ Share PBM success stories (P3, P7, P9, P11, P15) ▪ Foster collaborative/multidisciplinary healthcare approach (P5, P9, P10) ▪ National PBM policies and directives (P1, P14, P16) ▪ Financial support and budget for PBM (P5, P11) ▪ Educate and empower patients (P 2, P 5, P9, P11, P12, P13) ▪ Focus on primary healthcare (P2, P3, P5, P10, P13) ▪ Prioritise women’s and children’s health (P11, P5, P8) ▪ Community health focus – community health workers to educate communities (P6, P10, P14, P15) ▪ Early patient referrals (P4, P14) ▪ Audit of blood usage (P1, P6, P10, P12) ▪ Data integration between hospitals and Blood Service to monitor and report blood usage (P10, P12, P14) ▪ Electronic blood ordering (P10) ▪ Governance and accountability (P6, P10, P12, P14) ▪ Availability of haematinics (P3, P5, P6, P8, P9) ▪ Set up iron infusion clinics (P9) ▪ Serum ferritin testing for high-risk iron deficiency patients (women) (P9) ▪ Focus on implementing PBM Pillar 1 (P1, P3, P4, P7, P9, P12) ▪ Address pre-operative anaemia (anaemia management clinics needed) (P1, P5, P15) ▪ Blood accountability forms must be mandatory hospitals (P6, P7, P11, P12, P13) ▪ Modify blood ordering forms to ask whether alternatives to transfusion have been considered (P3) ▪ Mandatory motivation for ordering blood transfusions (P4) ▪ Proper informed consent for blood transfusion (P4, P12, P14) ▪ Analysis of healthcare setting & needs (P15) ▪ Identify and acknowledge challenges and barriers (P2, P11, P14, P16) ▪ Lead PBM champion needed as a catalyst (P7, P10, P15) ▪ Create a career path for PBM Transfusion practitioners (P1) ▪ Bigger role and advisory support from Haematologists (P14) ▪ PBM implementation guidelines for hospitals (P10) ▪ Infrastructure to support PBM (space for pre-op clinics, computers) (P10) ▪ Anaemia and iron focus (Iron infusion clinics, ferritin testing, prescribing oral iron as a first tool (P3, P5, P6, P8, P9, P11, P16) ▪ Access to reliable point-of-care testing (P3, P8, P13, P14)

- Introduce microsampling/microbleeding (P3, P6, P7, P9, P11, P13, P15)
- Nurses are key-get them on board (P5, P7, P8, P9, P10, P10, P12, P13)
- More PBM champions are needed (P1, P3, P5, P9, P11, P12)

LETTER TO DELPHI PANEL - ROUND ONE

Developing a validated framework for a Patient Blood Management (PBM) toolkit appropriate for the South African healthcare context

Dear Doctor/Professor

Thank you for agreeing to participate in this Delphi survey. I appreciate your time and contribution to this research. The Delphi technique is a semi-quantitative data collection approach which involves a series of sequential questionnaires or 'rounds,' interspersed by controlled feedback that seek to gain the most reliable consensus of opinion of a group of experts.

Structure of the questionnaire

The questionnaire was developed after undertaking a critical review of the literature and conducting semi-structured interviews with PBM champions working in various disciplines at hospitals across South Africa. The PBM champion participants have suggested various tools for inclusion in a PBM toolkit for South Africa. Their suggestions; as well as recommendations from the literature have been compiled into statements which will be independently validated by you and other PBM experts through the Delphi survey. The questionnaire is subdivided into five sections from A through to E.

Procedure of the Delphi process

Your opinion as a participant is sought on the relative importance of each criterion listed in the survey. All information provided and opinions offered will be treated as strictly confidential. Please note that no respondent will know the identity of any other respondent. Only the researcher and study supervisors will have this knowledge. Please ensure that you keep all information pertaining to this research and questionnaire strictly confidential, both in this, and the subsequent rounds of the Delphi process. After each round, feedback will be provided to the participants.

Please complete the questionnaire as follows:

Please click on the Survey Monkey link that has been included in the email to access the survey. Each statement must be evaluated in respect of its importance as an aspect or criterion that must be included in the framework to guide the development of a PBM toolkit appropriate for hospitals in South Africa.

PLEASE ANSWER ALL QUESTIONS IN ALL FIVE SECTIONS.

You are required to indicate your response to the presented statements on the three-point Likert scale. These points are as follows:

1 = Essential (This criterion must **DEFINITELY BE INCLUDED** in the framework)

2 = Useful (This criterion **CAN BE INCLUDED** in the framework)

3 = Unnecessary (This criterion must **BE EXCLUDED** from the framework)

Please complete the electronic questionnaire in one sitting. There is no option to save your responses and complete the questionnaire at a later time. The questionnaire in this round should take approximately **1-2 hours to complete**.

Please complete the questionnaires by the **19th of October 2022**. The analysis can only be done once all participant responses are received; your cooperation with regards to the deadline is greatly appreciated. Please contact me should you have any questions or uncertainties.

Thank you again for your time and contribution.

Vanitha Rambiritch (Researcher)
PhD Student - University of Cape Town
Faculty of Health Sciences – Department of Medicine
Head of Learning and Development - KZN
South African National Blood Service.

Supervisor

Professor Vernon J. Louw
Chair and Head of Division Clinical Haematology, Department of Medicine
Groote Schuur Hospital, University of Cape Town.

Co-supervisor

Professor Estelle Verburgh
Clinical Haematologist and Associate Professor of Medicine
Division of Clinical Haematology, Department of Medicine
Groote Schuur Hospital, University of Cape Town.

Welcome and introduction

Thank you for taking the time to participate in this study.

By proceeding with the survey, it is accepted that you give informed consent to participate in this study. Your time, input and contribution is very much appreciated.

STUDY AIM: To develop a validated framework for a South African healthcare needs focused Patient Blood Management (PBM) toolkit encompassing the essential, cost effective, feasible, evidence based PBM guidance measures to serve as a template to inform the development of a clinical practice PBM toolkit for optimizing the care of patients and avoiding the inappropriate use of blood transfusions.

In professional education, a **‘toolkit’ is defined as a resource that helps a professional improve his or her competence, knowledge or skills.** For the purpose of this study, a PBM toolkit will comprise a host of guidance resources serving as tools to aid clinicians in diagnosing and treating anaemia, and managing bleeding and blood loss in patients. Tools for a PBM toolkit may be in the form of guidelines, standard operating procedures, diagrams, educational material, recorded lectures, posters, videos, case scenarios, information alerts, etc.

Please fill in your details below

Name	
Hospital	
Country	
Designation/Title	
Discipline / Department	
Type of healthcare setting (Public/Private/Other)	
Number of years as a healthcare professional	
Number of years involved with PBM	

You have been selected to participate in this study based on your PBM knowledge and expertise and your active involvement in leading and guiding PBM implementation. Your opinion as a participant is sought on the relative importance of each criterion listed in the survey. Each statement must be evaluated in respect of its importance as an aspect or criterion that must be included in a framework to guide the development of a PBM toolkit appropriate for the South African healthcare environment.

This survey comprises five sections. You are required to rate each statement in every section as either:

Essential: (This criterion must **DEFINITELY BE INCLUDED** in the framework for a PBM toolkit)

Useful: This criterion **CAN BE INCLUDED** in the framework for a PBM toolkit)

Unnecessary: This criterion must **BE EXCLUDED** from the framework for a PBM toolkit)

This first round of the Delphi survey will require 1-2 hours of your time. Thank you for your time and contribution.

Why PBM implementation is needed in South Africa?

SECTION A: The importance of PBM implementation in South Africa and the need for a PBM toolkit.

This section deals with the reasons why PBM implementation is important in South Africa and why a PBM toolkit is needed.

1. How would you rate the following reasons for why PBM implementation is important in South Africa

It is a holistic healthcare approach.

☐

Essential

☐

Useful

☐

Unnecessary

Comment

It can improve the healthcare of the nation.

☐

Essential

☐

Useful

☐

Unnecessary

Comment

It is based on patient focused outcomes.

☐

Essential

☐

Useful

☐

Unnecessary

Comment

It protects patients' rights and safety.

☐

Essential

☐

Useful

☐

Unnecessary

Comment

It supports a preventative healthcare paradigm.

☐

Essential

☐

Useful

☐

Unnecessary

Comment

It will improve women and children's health.

☐

Essential

☐

Useful

☐

Unnecessary

Comment

It is a quality improvement healthcare approach.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

It is a practical approach to address the high prevalence of anaemia.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

It offers opportunity for early detection & correction of anaemia.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

PBM is not only about surgery; it has a wide healthcare reach.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

It is an opportunity to change mindsets and historic practices of doctors with regards to blood transfusions.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

It is an approach to conserving donor blood which is a scarce resource.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

It encourages rational blood use thus preventing unnecessary transfusions.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

It can reduce morbidity & mortality.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

It is a means to avoid and reduce transfusion adverse effects.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

It encourages research driven improved clinical practices.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

It would make doctors more vigilant about their clinical approach to anaemia prevention and treatment.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

It offers financial benefits to patients and the healthcare system.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

PBM implementation is achievable and South Africa can do it.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Implementation of PBM Pillar One is a good enough start for South Africa.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Need for a PBM toolkit in South Africa.

In professional education, a 'toolkit' is defined as a resource that helps a professional improve his or her competence knowledge, or skills. For the purpose of this study, a PBM toolkit will comprise a host of guidance resources serving as tools to aid clinicians in detecting and managing anaemia, bleeding and blood loss in patients.

2. How would you rate the following reasons why a PBM tool kit is needed in hospitals in South Africa?

A toolkit will help to jumpstart PBM implementation in South Africa.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

A toolkit will serve as a driver to align clinical practices to the pillars of PBM.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

A toolkit will make PBM practically doable.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

It will serve as a quality improvement approach to patient care and overall healthcare.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

A toolkit will enable the empowerment of healthcare workers by creating better awareness and improved knowledge of PBM.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

It will serve as an educational platform for continuous medical education.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

It will encourage clinically appropriate practices.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

A toolkit will provide guidance and support for junior doctors.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

It will provide quick clinical guidance as needed in a time constraint working environment.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

It will encourage accountability in clinical decision making.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

It will help to change the historic culture of inappropriate transfusion practices.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

It will encourage the use of blood conservation approaches.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

It will serve as encouragement for application of best practice recommendations.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

SECTION B: Audit and Monitoring of blood usage in hospitals.

This section deals with the need to audit and monitor blood usage in hospitals and how best this should be done.

3.1 How would you rate the need to monitor / audit the use of blood and blood products in hospitals?

☐ Essential ☐ Useful ☐ Unnecessary

Comment

3.2. Who should monitor the usage of blood products?

	Essential	Useful	Unnecessary
Blood Services.	☐	☐	☐
Hospital management.	☐	☐	☐
Transfusion practitioner appointed for the hospital.	☐	☐	☐
Hospital appointed transfusion/ PBM nurse.	☐	☐	☐
Blood users committee/PBM committee/Hospital transfusion committee.	☐	☐	☐
Heads of each department.	☐	☐	☐
Department of Health.	☐	☐	☐

Comment

PBM tools appropriate for Primary, Secondary and Tertiary level healthcare facilities.

SECTION C: Guidance resources needed as tools for a PBM toolkit appropriate for primary, secondary and tertiary level hospitals/healthcare facilities respectively in South Africa .

This section deals with selecting the essential, cost-effective, feasible, best practice, evidence based measures and resources as clinical practice tools for a PBM toolkit appropriate for Primary, Secondary and Tertiary level hospitals/healthcare facilities in South Africa.

Please rate the importance of the following as tools for a PBM toolkit appropriate for PRIMARY, SECONADRY and TERTIARY LEVEL hospitals/healthcare facilities respectively.

Tools for a PBM toolkit may be in the form of guidelines, standard operating procedures, diagrams, educational material, recorded lectures, posters, videos, case scenarios, information alerts, etc.)

4.1 ANAEMIA FOCUS TOOLS.

4.1.a. Tools for detection and management of anaemia.

Anaemia detection algorithms/flowcharts.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Flowcharts for the selection of the appropriate laboratory tests (When to order what tests?).

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Identifying the underlying causes of anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Treating underlying causes - anaemia management algorithms with scenarios wherever possible.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary	☐	☐	☐

Comment

List of drugs that cause anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

When to refer patients for further evaluation.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

4.1.b. Iron deficiency anaemia diagnosis and treatment tools - Advice on the following:

The importance of serum ferritin screening on patients.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Information on the use and interpretation of iron studies.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Fasting samples must be taken for reliable iron study results.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

Prescribing oral iron: How and when it should be taken.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Monitoring patients on oral iron treatment.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Information on prevention and management of the side effects of oral iron.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

4.1.c IV Iron Tools

Demystify IV iron use – Provide scientific basis that argue the myths.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Indications for IV iron.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

IV iron - administration, timing and dosage.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

IV iron-Preventing and managing adverse events.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Digital forms to simplify the motivation for IV iron to funders.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

4.1.d. HIV related anaemia tools

Simplified diagnostic approach to anemia in HIV-infected individuals.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Risk factors associated with anaemia in HIV infection (*history of clinical AIDS, CD 4 cell count of 200 cells/ml, plasma viral load, women, Zidovudine use, increasing age, lower body mass index, history of bacterial pneumonia, oral candidiasis, history of fever, etc.*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

The major causes of HIV related anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Drugs that commonly cause myelosuppression in HIV-infected patients.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Identify and correct the treatable causes of anemia in HIV-infected patients.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Manage anaemia of inflammatory disease (previously termed anaemia of chronic disease) as a cause of HIV related anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Vigilance in the treatment of opportunistic infections to which HIV positive patients are susceptible that can lead to anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Malignancies that can lead to anemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

What are the current treatment guidelines for anemia in HIV-infected persons.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Interpretation of iron studies in HIV patients.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Use of HAART (Highly Active Antiretroviral Therapy)- the impact of various HAART regimens on anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Anaemia in the HIV population should never be regarded as "normal" and a patient who continues to be anaemic after effective ART should be investigated for other causes of the anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

Use of recombinant erythropoietin such as erythropoietin alfa.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Considerations for blood transfusion in patients with the HIV related anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

30% of patients living with HIV can have a positive Coombs test. Positive Coombs test makes crossmatching difficult so that only the “least incompatible” blood can be issued. The importance of weighing the risk of transfusing “least incompatible” needs to be considered.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

4.2 Policies/protocols/standard operating procedures needed as tools

Anaemia management protocol.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Diagnosis of anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Screening for anaemia protocol.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Pre-operative anaemia optimization protocol.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Pre-operative evaluation for bleeding risk.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Intra-operative coagulation assessment.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Post-operative assessment of bleeding risk.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Management of anticoagulants in the peri-operative period.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Bridging anticoagulation guidelines.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Use of point-of-care coagulation testing and interpretation, e.g TEG, ROTEM.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Massive bleeding (general): Massive haemorrhage protocol.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Management of postpartum haemorrhage.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Point-of-care coagulation testing.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Management of trauma associated haemorrhage.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Blood ordering, blood product indications and blood usage policy.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Cardiac surgery associated haemorrhage.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Discipline specific PBM / transfusion guidelines.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Guidelines for blood ordering at hospitals with no onsite blood banks.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Blood conservation approaches.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Blood management at hospitals with no onsite blood banks.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

How to use point-of-care equipment - Do's and Don'ts.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

TEG protocol.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Guidelines for when to refer patients to the Haematologist.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Guidelines for when to refer patients to the Gastroenterologist.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Guidelines for when to refer patients to the Gynaecologist.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Guideline for management of cancer related anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Policy for the management of HIV related anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

PBM tools appropriate for Primary, Secondary and Tertiary level healthcare facilities.

4.3 Tools for a complete care paradigm for women.

Guidelines for monitoring iron levels in obstetric patients.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

Management of iron deficiency in obstetric patients.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

Checking iron levels 6 weeks postpartum.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

Post-operative iron protocol for Cesarean sections.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

Guideline for PBM in obstetric bleeding emergencies.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

Checking iron and ferritin levels following treatment of anaemia caused by heavy menstrual bleeding.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

Guidelines for referral of patients for workup of anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

Iron treatment in pregnancy protocol.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

PBM tools and toolkit look and feel.

4.4 Tools for minimizing iatrogenic blood loss

Microsampling / microbleeding (smaller volume blood sample collection) benefits.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Avoiding unnecessary repeat laboratory testing.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

4.5 Tools for pre-operative, intra-operative and post-operative patient care. Advice on:

Pre-operative anaemia optimization.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

Management of iron deficiency anaemia in surgical patients (Pre-op, intra-op and post-op).

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Post-operative patient care guidelines.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Surgical considerations (haemostasis, lowering blood pressure, normothermia).

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Meticulous haemostasis and surgical techniques.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Blood sparing surgical techniques.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Anaesthetic blood conserving strategies.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Vigilant monitoring and management of post-operative bleeding.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Preventing secondary post-operative haemorrhage.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Avoid/treat infections promptly.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Indications and contra-indications for intraoperative/ postoperative autologous blood collection and re-transfusion.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Use of autologous blood donation.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Cell salvage protocols.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Videos on cell salvage methodology.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Bleeding assessment tools.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Bleeding management tools.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Blood loss formula calculator for predicting blood loss.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

List of medications and supplements that cause bleeding.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Screening patients that are at high risk for bleeding.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Monitoring patients on anticoagulant/anti-platelet therapy.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Limiting dilutional coagulopathy - Guidance on crystalloid use and dangers of over use.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Early post-operative feeding versus upper GI haemorrhage prophylaxis.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Use of erythropoietin.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Use of aprotinin.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Use of tranexamic acid.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Optimize cardiac output.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Optimize ventilation and oxygenation.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Optimize anaemia reserve.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Maximize oxygen delivery.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Minimize oxygen consumption.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Prescribing pain medication with considerations for bleeding risk e.g. NSAIDS, aspirin, etc.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

4.6 Transfusion decision making tools

Products, services and testing offered by the Blood Services.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Transfusion risks and hazards.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Cost of blood and blood products, including surcharges and levies for emergency and out of hours testing and services.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Restrictive transfusion thresholds.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Single unit transfusion focus - transfuse and assess strategy.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

4.7 Tools to assist hospitals in setting up PBM programs

Guidelines for setting up healthcare setting appropriate PBM program.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Self-audit guidelines and checklists.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

PBM readiness checklists for hospitals to serve as a needs analysis.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Setting metrics/targets – measures to see if set PBM targets are being met.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Transfusion control measures – control measures for when patients should be transfused to ensure patients are transfused only when clinically necessary.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

PBM checklists for patient history taking e.g. *Has the patient had a full blood count in the last six weeks, has the patient had an iron study, does the patient have the following symptoms, did the patient bleed intraoperatively? How much do you think the patient bleed? Postoperative bleeding?*

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Easy access templates for hospitals to write their PBM related protocols.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Templates/checklists to identify bleeding risk.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Laboratory tools - List of tests to request for bleeding disorders.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Laboratory tools - List of tests for detection of anaemia and when to request what tests.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Laboratory awareness tools - What do elevated and/or decreased test results mean.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Guidance on how to set up pre-operative anaemia and bleeding clinic.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Referenced literature providing evidence base for PBM implementation in South Africa, low and middle-income countries and global.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

How to set up hospital transfusion committee/blood user committee/PBM committee.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Standing meeting agenda templates for hospital transfusion committee/blood user committee/PBM committee meetings.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Committee representation guidelines for hospital transfusion committee/blood user committee/PBM committee.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Standardized blood accountability forms.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Comprehensive informed consent documents for blood transfusion.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Code of conduct for ordering and administering transfusions.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Audit tools (How to carry out an audit e.g. transfusion use, iron reactions, etc).

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Implementing electronic blood ordering systems.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Guidance on how to implement policies/protocols/guidelines.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

3.8 Other tools.

Blood ordering form should include questions on whether alternate approaches other than transfusion have been considered for the patient.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Blood usage/monitoring dashboard (one could login to a common portal and view blood usage of hospitals.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Share PBM success stories (local and global).

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Questions and Answers platform e.g. PBM *WhatsApp* group.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Information alerts giving updates on changes in clinical practices or changes in protocols/procedures.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

5. How would you rate the importance of the following PBM modalities in PRIMARY, SECONDARY and TERTIARY healthcare facilities respectively in South Africa?

Oral iron

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

IV iron

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Erythropoietin

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Tranexamic acid.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Intra-operative normovolaemic haemodilution.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Cell salvage equipment.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Optimizing anaemia before elective surgery.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Single unit transfusions.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Blood accountability forms.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Motivation for blood transfusion.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Point-of-care testing (POCT) Haemoglobin.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

POCT Haematocrit

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

POCT INR

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

POCT Platelet Function

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

POCT intra-operative coagulation monitoring (e.g. ROTEM or TEG)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

6. Toolkit look & feel: Please rate the following options in terms of how the toolkit should be made available for practical access and use.

	Essential	Useful	Unnecessary
All-inclusive package including videos, diagrams, lectures/podcasts, policies, procedures, templates, etc.	☐	☐	☐
Digital / electronic toolkit with all of the above.	☐	☐	☐
Physical/Paper based toolkit with all of the above.	☐	☐	☐
Should be a combination of Digital and Physical.	☐	☐	☐
Should be in a poster format.	☐	☐	☐
There should be separate toolkits for public and private sector hospitals.	☐	☐	☐
There should be a PBM toolkit specific for nurses.	☐	☐	☐

Comments

PBM education deficiencies and education failures that need to be addressed.

SECTION D: PBM education deficiencies and education failures.

*This section deals with the PBM knowledge deficiencies that need **to be addressed amongst the various stakeholder groups, including existing education failures.***

7.1 Please rate the importance of addressing the following PBM knowledge deficiencies amongst **DOCTORS** and **NURSES** respectively

PBM education deficiencies

a. General aspects of PBM

PBM definition and benefits of PBM.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

PBM Pillars - What do they mean and how to apply them.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Multidisciplinary care paradigm.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Knowledge of haemostasis.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Role of the nurse in PBM and importance of role empowerment.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Role of the laboratory in PBM.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Management and optimal use of resources in resource constraint healthcare settings.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

PBM education deficiencies and education failures that need to be addressed.

Addressing PBM education deficiencies

b. Anaemia workup and diagnosis

Anaemia is treatable.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Approaches to early diagnosis and treatment.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

When to order what laboratory tests.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Understanding laboratory test results.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Consequences of anaemia.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Medications that cause anaemia.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Consequences of iron deficiency anaemia on women and children.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Managing obstetric emergencies.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Addressing PBM education deficiencies

c. Blood Banking

Knowledge of blood and blood products and their indications.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Blood ordering – When to order what products.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Blood transfusion is not the first choice treatment for anaemia.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Cost of blood and blood products.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Cost of testing (various crossmatch types) including out of hours levies/surcharges.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Blood wastage - Blood Service and Health Service implications.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Ordering blood on a returnable basis (BRB) benefits.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Appropriate storage of blood and blood products.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Appropriate use of blood and blood products.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Difference between PBM and Blood Conservation.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

HIV related anaemia management.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Addressing PBM education deficiencies

d. Ethical aspects

Ethical aspects of the use of blood and blood products.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Process for informed consent.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Doing enough and what is best for patients - patient specific considerations.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Autonomy and patients' rights.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Medico-legal implications of inappropriate anaemia management.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Medico-legal implications of inappropriate blood transfusions.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Taking the time to give patients appropriate clinical advice.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Making time for patient education and empowerment.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Ethical imperative for PBM.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Addressing PBM education deficiencies

e. Clinical aspects

Clinically appropriate transfusion decision making (Moving away from knee jerk reactions to a more informed approach).

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Transfusion risks and hazards.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Restrictive transfusion thresholds.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Adequate assessment of patients - Taking proper history is important for PBM.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

How to administer and monitor blood transfusions.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Four hour rule (transfusion should not exceed four hours from start of the infusion).

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Early patient referrals.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Single unit transfusion practice.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Addressing PBM education deficiencies

f. Blood conservation

Alternate approaches to anaemia management other than transfusion.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Autologous transfusion options.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Cell salvage.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Addressing PBM education deficiencies**g. Surgical aspects**

Pre-operative, intra-operative and post-operative patient care.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Pre-operative anaemia optimization.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Timing of surgery - When to delay surgery.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Use of tranexemic acid and other antifibrinolytics.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Addressing PBM education deficiencies**h. Oral iron and IV iron**

Oral iron and IV iron – When to administer what.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

How to take oral iron e.g. dosing and scheduling.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Follow up of patients on oral iron.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Iron metabolism - role of hepcidin in iron absorption.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

IV iron myths - demystify use.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

IV iron - Dosage and administration.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

IV iron - Preventing and managing adverse events.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Addressing PBM education deficiencies.

i. Preventing iatrogenic blood loss

Taking smaller volume samples for laboratory testing (micro-sampling/micro-bleeding).

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Avoiding unnecessary repeat testing.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Benefits of Point-of-care testing (POCT).

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

TEG and ROTEM use and interpretation.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Addressing PBM education deficiencies

j. Bleeding and blood loss.

Identifying high risk patients.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Medications, herbs and supplements that increase bleeding risk.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Managing bleeding risk.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Managing patients on anticoagulant/anti-platelet therapy.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Effects of drug interactions.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

7.2 Please rate the importance of addressing the following PBM awareness aspects amongst management and administrative stakeholders such as hospital management, medical aids, and finance related stakeholders.

	Essential	Useful	Unnecessary
Role of management/leadership support in PBM.	☐	☐	☐

Comment

Management and healthcare leadership roles in creating improved health culture.

☐☐☐

Comment

Cost saving benefits associated with PBM.

☐☐☐

Comment

Cost comparisons - Blood and blood products versus alternative approaches to treatment of anaemia (haematinics, pharmacological agents).

☐☐☐

Comment

Patient care benefits associated with PBM.

☐☐☐

Comment

Community healthcare benefits associated with PBM.

☐☐☐

Comment

Importance of ensuring
availability of hematinics e.g.
iron, B12 and folate.

☐☐☐

Comment

Importance of ensuring
availability of
pharmacological/haemostatic
agents.

☐☐☐

Comment

Patient education and empowerment

8. EDUCATION NEEDS FOR PATIENT EMPOWERMENT.

8.1 How would you rate the importance of creating a patient- centred culture?

☐

Essential

☐

Useful

☐

Unnecessary

Comment

8.2 Please rate the importance of addressing the following PBM awareness needs amongst patients.

Essential

Useful

Unnecessary

Causes of anaemia.

☐☐☐

Comment

Consequences of anaemia.

☐☐☐

Comment

Symptoms and signs of anaemia.

☐☐☐

Comment

Iron deficiency anaemia.

☐☐☐

Comment

How to take oral iron.

☐☐☐

Comment

Dealing with the side effects of oral iron.

☐☐☐

Comment

Consequences of anaemia in pregnancy.

☐☐☐

Comment

Consequences of
anaemia in children.

☐☐☐

Comment

Basics of blood
testing and blood
results.

☐☐☐

Comment

Autonomy and
patients rights,

☐☐☐

Comment

General health
awareness and
taking ownership of
health.

☐☐☐

Comment

Importance of
seeking medical
guidance from the
right people.

☐☐☐

Comment

Change mindset of
patients "Doctor
always knows best"
philosophy.

☐☐☐

Comment

Importance of
proper informed
consent for
transfusion.

☐☐☐

Comment

Options for patients
who refuse blood
transfusions.

☐☐☐

Comment

8.3 Approaches to educating and empowering patients.

8.3.1. Please rate the value of the following approaches to aid in creating better awareness of anaemia amongst patients.

	Essential	Useful	Unnecessary
Information campaigns by healthcare workers/healthcare organizations.	☐	☐	☐
Comment			
Use of radio power.	☐	☐	☐
Comment			
Use of social media.	☐	☐	☐
Comment			
Make available language appropriate information booklets for patients.	☐	☐	☐
Comment			
Patient education and empowerment talks.	☐	☐	☐
Comment			
Asking doctors questions about treatment options.	☐	☐	☐
Comment			
Medical aids serving as a voice to educate patients.	☐	☐	☐
Comment			
Patients empowering patients with information.	☐	☐	☐

Comment

Digital education
app. for patients.

☐☐☐

Comment

Videos and posters
in waiting rooms
(primary, secondary
and tertiary
healthcare facilities).

☐☐☐

Comment

Community
healthcare workers
providing education
in the respective
communities.

☐☐☐

Comment

Sharing of patient
stories (eventful and
uneventful).

☐☐☐

Comment

Online education
e.g. YouTube type
videos.

☐☐☐

Comment

9. Please rate the importance of addressing the following education failures that impact PBM implementation in hospitals in South Africa.

Lack of support from hospital management.

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Lack of support for PBM from Heads of Department impacting intern training and practice.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Linear type medical education culture where education is mainly knowledge or theoretically focused rather than being practical or application focused.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Lack of PBM education in undergraduate medical education for doctors.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Lack of PBM education in undergraduate medical education for nurses.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Lack of PBM education in postgraduate education for doctors.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Lack of PBM education in postgraduate education for nurses.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Lack of education on good clinical transfusion practices in undergraduate medical education.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Lack of education on good clinical transfusion practices in postgraduate medical education.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Absence of accredited PBM training programs in South Africa and Africa.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Locally relevant PBM training content is needed.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Lack of online self-learning PBM learning programs for South Africa.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Lack of training on how to utilize healthcare resources optimally i.e. practicing in resource constraint settings.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Interns not attending scheduled PBM related training sessions.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

PBM training to empower nurses is lacking yet they are the 'ears and eyes of doctors.'

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Philosophical education approaches - therefore not translated in practice.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Education of the educators is needed.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Absence/lack of of PBM education initiatives for administrative stakeholders such as medical aids, hospital management and finance stakeholders.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Pitch education at appropriate levels for the different categories of healthcare professionals.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Doctors should be taught by doctors, surgeons should be taught by surgeons, nurses be taught by nurses.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Addressing challenges and barriers to PBM implementation in South Africa.

SECTION E: Challenges and barriers to PBM implementation in South Africa and how a PBM toolkit may help with implementation.

This section deals with the need to address existing challenges and barriers that will help to enable PBM implementation in hospitals in South Africa.

10. Please rate the importance of addressing the following barriers and challenges to PBM implementation in South Africa.

Addressing barriers and challenges to PBM implementation

10.1 Awareness, education and buy-in.

PBM is perceived as overwhelming - it is more work for doctors.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Lack of PBM knowledge and awareness amongst healthcare workers across all settings (primary to tertiary healthcare levels).

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Awareness talks and initiatives attract the same individuals who are usually already on board with PBM. Awareness reach is not wide enough to target and get others on board.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Lack of PBM awareness amongst General Practitioners; yet GP environment is ideal for early diagnosis and correction of anaemia.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Nurses are often excluded from PBM awareness initiatives yet they have a key role to play in PBM.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

PBM awareness in primary healthcare clinics is very poor yet it is the ideal environment for early detection, correction of anaemia and early referral.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Community health workers are not educated on PBM; they are ideal partners to educate communities using language and level appropriate for various communities.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Absence/lack of PBM education during internship training phase of doctors.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of PBM guidance and support for doctors at all levels in hospitals.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

It should be mandatory for doctors to attend a dedicated education/orientation training on good clinical transfusion practices before they can transfuse patients.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Limited access to advisory support from Haematologists in the private and public sector.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

PBM has not formally been endorsed by key stakeholders (Department of Health, South African Medical Association, Medical Aids). Uptake is therefore poor.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of buy-in and support from senior leadership in hierarchical structures within hospitals.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Some specialties not on board with PBM. If you agree, please comment which...

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Private hospitals not on board with PBM.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.2. Culture of practice amongst doctors.

Longstanding/historic practice of prescribing blood transfusions for treatment of anaemia persists.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Ego of doctors - making transfusion practice changes difficult.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Access to blood is easy. It is therefore an overused quick fix to correct anaemia.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Doctors are overworked; dealing with high patient numbers in public healthcare sector. Transfusion therefore often becomes the quickest and easiest approach to correct low haemoglobin levels in patients.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Doctors chase numbers when it comes to patients' haemoglobin levels.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Some consultants leave junior doctors without support with regards to transfusion practice.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Private healthcare culture – Doctors are not answerable and not open to be told what to do with regards to transfusion practice.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Focus is still on 'product' rather than 'patient.'

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Transfusion triggers vary amongst clinicians within the same discipline.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Lack of multidisciplinary PBM approach in treating patients with anaemia.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Single unit transfusions (transfuse and assess strategy) in non-bleeding patients is not a culture of practice in most settings.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of surgical capability in district hospitals - Patients have to be referred causing delay in treatment.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Understanding of response time required for oral and IV iron to work.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Access to IV iron in all level hospitals.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of accountability.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.3 Finance related challenges.

Inadequate budget for laboratory screening tests. Anaemia goes undetected in certain patients at primary healthcare facilities and district hospitals preventing early treatment.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Silo budgets - Separate laboratory budget, blood budget, pharmaceutical budget etc.
preventing certain good practices due to administrative controls e.g. spending a little more
on the laboratory budget can result in savings on the blood budget.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Gatekeeping challenges placing restrictions on ordering of blood tests.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Insufficient funds to purchase Point of care testing devices.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Inadequate budget to cover costs associated with cell salvage including the cost of needed
consumables.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

TEG - expensive to run tests.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Not enough budget to employ more hospital staff. Current staff are already overworked with
little motivation to do more than they are already doing.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.4 Capacity - Manpower challenges.

No dedicated person (nurse/doctor) that takes control of PBM in a specific hospital.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

No transfusion practitioners in hospitals.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

No dedicated PBM nurses in hospitals.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Not enough PBM champions.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

No transfusion medicine specialists in hospitals in South Africa.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Not enough staff to run pre-operative anaemia clinics.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

No time to review blood accountability forms and monitor blood usage.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Backlog of surgical cases - Cannot delay surgery to optimize anaemia in patients.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Doctors spending time on administrative tasks due to lack of administrative support in public healthcare sector.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.5 Anaemia burden.

High anaemia prevalence in South Africa. Patients frequently present with anaemia and 'accepted' as a norm.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Prioritization of anaemia in non-surgical patients is poor.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Anaemia is often underdiagnosed and in some patients it goes undetected.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Not enough priority is given to treating the causes of anaemia.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Oral iron, and not blood transfusion should be the first modality for correcting iron deficiency - This is not a common culture of practice especially in hospitalized patients.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Oral iron is not always well tolerated by some patients - more tolerable iron preparations come at a higher cost.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Patients are not educated on how to take oral iron.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Pre-operative anaemia optimization is not a routine practice in hospitals.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Oversampling of patients/unnecessary repeat blood tests contribute to anaemia in hospitalized patients.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Use of smallest size blood collection tube practical for laboratory analysis is not a culture of practice.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Small size tubes are not always available for use in adult wards.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Primary healthcare facilities are under-resourced for early detection and correction of anaemia (Lack of staff, training, access to laboratory testing, inadequate stocks of oral iron, B12 injections in some facilities).

☐ Essential ☐ Useful ☐ Unnecessary

Comment

District hospitals not adequately geared for anaemia detection and management (Lack of staff, lab testing limitations) - These place burden on tertiary facilities when patients end up complicated.

- ☐ Essential
- ☐ Useful
- ☐ Unnecessary

Comment

Lack of patient-centered healthcare culture.

- ☐ Essential
- ☐ Useful
- ☐ Unnecessary

Comment

Patients not empowered and educated with regards to iron deficiency and the associated consequences.

- ☐ Essential
- ☐ Useful
- ☐ Unnecessary

Comment

Addressing challenges and barriers to PBM implementation in South Africa.

Addressing barriers and challenges to PBM implementation

10.6 Logistical challenges.

Patients not referred early enough to allow for anaemia workup and treatment.

☐

Essential

☐

Useful

☐

Unnecessary

Comment

No onsite Pathology laboratory in some public hospitals causing delays in laboratory testing.

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Delays in receiving laboratory test results in the public sector.

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Delay in anaemia diagnosis often lead to patients' condition having deteriorated by the time they get to tertiary facilities.

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Patients go home before tests results are received, and with no treatment.

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Patients travel long distances to tertiary care facilities.

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Not enough hospital beds to admit patients while awaiting test results for proper diagnosis and treatment.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Patients return to healthcare facilities in worse off conditions.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Some patients never return for treatment / follow up.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Hospitals not having onsite blood banks - more blood is ordered as a safety measure to prevent transfusion delays.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation
10.7 Department of Health.

Silo culture (independent operations and budget management) of health departments in the various provinces causing regional disparities.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of national policies/protocols to guide PBM related practices.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Primary health care facilities not optimally functional/resourced to apply the principles of PBM principles.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Poverty in society contributes to dietary insufficiencies thus contributing to the anaemia burden.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of attention given to the clinical significance of anaemia in the South African population.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.8 Policy challenges.

Not enough policies to guide practices e.g. anaemia, PBM, transfusion. (Please specify where necessary).

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of national policies e.g. anaemia, PBM, transfusion (Please specify where necessary).

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Absence of transfusion focus in the National Core Standards for Health Establishments in South Africa.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Access to policy makers to endorse policies is a challenge.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Lack of guidelines on creating, changing and reviewing policies.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Fragmented policies - no standard blood transfusion policy in hospitals.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Poor/slow implementation of PBM protocols/policies in clinical practice.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Monitoring of compliance to policies is lacking.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

No specific guidance on PBM in Essential Medicine List guidelines.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Lengthy guidelines - Simple stronger policies are needed.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Lack of multidisciplinary collaboration in policy development.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Challenges getting timeous endorsement of policies by department of health at national level.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Challenges getting timeous endorsement of policies by department of health at provincial level.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Policies e.g. transfusion, PBM, anaemia, blood conservation should come from the Health Department and not the Blood Services.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.9 Infrastructure challenges.

Lack of space and infrastructure to set up anaemia clinics.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Absence of and/or dysfunctional computer systems and IT support for access to laboratory results is poor.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Absence of electronic blood ordering systems which can create alerts/warnings preventing unnecessary blood ordering.

- ☐ Essential
- ☐ Useful
- ☐ Unnecessary

Comment

Computer systems between hospitals and blood banks are not linked.

- ☐ Essential
- ☐ Useful
- ☐ Unnecessary

Comment

Lack of emergency medical transport services cause delay in transferring patients with bleeding and blood loss to secondary/tertiary facilities.

- ☐ Essential
- ☐ Useful
- ☐ Unnecessary

Comment

Addressing challenges and barriers to PBM implementation in South Africa.

Addressing barriers and challenges to PBM implementation

10.10. Lack of general PBM resources/modalities in hospitals.

Hematinics in primary healthcare facilities not always available.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Blood warmers not available in most hospitals.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of cell salvage equipment.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Consumables for cell salvage devices not available.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Oral iron not readily available.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

IV Iron not readily available.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

IV Iron access and motivation processes are tedious in the private healthcare sector.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of comfort with IV iron use.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of validated devices for point of care testing e.g. POCT heamoglobin, haematocrit, INR).

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Point-of-care coagulation testing not available in theatres.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Tranexamic acid not available in some hospitals.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Erythropoietin not available in some facilities.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.11. General challenges.

Lack of hospital monitoring systems for blood usage - Dependence on Blood Services for blood usage data.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

No accountability measures for irrational use of blood and blood products including blood wastage.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of proper informed consent process for transfusion.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Blood user committees either non-existent or not adequately functional.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Time challenges and/or poor commitment from members of blood users committee/hospital transfusion committee.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Blood requisition form does include questions on whether treatment options other than transfusion have been considered for the patient.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Blood requisition form does not ask for reasons why blood is being ordered for the patient.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Blood accountability forms are not used in all hospitals when ordering blood and blood products for patients.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Thank you very much for completing Round 1 of the Delphi survey. I will provide feedback on this round of the survey once all participant responses are submitted and analyzed. I will also communicate the details for Round 2 of the survey. Round 2 of the Delphi survey will be much shorter. I sincerely appreciate your time and contribution to this study.

General comments

Appendix E3

FEEDBACK ON DELPHI ROUND ONE

Developing a validated framework for a Patient Blood Management (PBM) toolkit appropriate for the South African healthcare context

Dear Doctor/Professor

Thank you once again for your participation in the Delphi process and your contribution in Round One of the survey.

Attached you will find the results of the first round of the Delphi process. I am sending you this feedback with the purpose of providing you with the results and information regarding the first round. You do not need to do anything with it.

According to Larson and Wissman, consensus is reached when 80% of the participants indicate a similar value (to a specific item) as their choice. In Round One of this Delphi survey, out of 793 statements, consensus was reached on 390 statements (49.2%) consensus.

Statements on which consensus was reached have been removed from the Round Two questionnaire, and only the remaining statements have been included for your consideration. In the feedback provided, you will note that all the statements on which consensus had been reached are presented/shaded in **GREEN**, and comments from participants are included. Where required, I have made comments in response to questions asked/comments made by the participants.

These are indicated next to the participant's comment as **"Comment VR"** in bold. Thanks to the degree of consensus reached, Round Two will be much shorter.

Kind regards

Vanitha Rambiritch

FEEDBACK ON DELPHI ROUND ONE

Developing a validated framework for a Patient Blood Management (PBM) toolkit appropriate for the South African healthcare context

Welcome and introduction

Thank you for taking the time to participate in this study.

By proceeding with the survey, it is accepted that you give informed consent to participate in this study. Your time, input and contribution is very much appreciated.

STUDY AIM: To develop a validated framework for a South African healthcare needs focused Patient Blood Management (PBM) toolkit encompassing the essential, cost effective, feasible, evidence based PBM guidance measures to serve as a template to inform the development of a clinical practice PBM toolkit for optimizing the care of patients and avoiding the inappropriate use of blood transfusions.

In professional education, a **'toolkit' is defined as a resource that helps a professional improve his or her competence, knowledge or skills.** For the purpose of this study, a PBM toolkit will comprise a host of guidance resources serving as tools to aid clinicians in diagnosing and treating anaemia, and managing bleeding and blood loss in patients. Tools for a PBM toolkit may be in the form of guidelines, standard operating procedures, diagrams, educational material, recorded lectures, posters, videos, case scenarios, information alerts, etc.

Please fill in your details below

Name

Hospital

Country

Designation/Title

**Discipline /
Department**

**Type of healthcare
setting
(Public/Private/Other)**

**Number of years as
a healthcare
professional**

**Number of years
involved with PBM**

You have been selected to participate in this study based on your PBM knowledge and expertise and your active involvement in leading and guiding PBM implementation. Your opinion as a participant is sought on the relative importance of each criterion listed in the survey. Each statement must be evaluated in respect of its importance as an aspect or criterion that must be included in a framework to guide the development of a PBM toolkit appropriate for the South African healthcare environment.

This survey comprises five sections. You are required to rate each statement in every section as either:

Essential: (This criterion must **DEFINITELY BE INCLUDED** in the framework for a PBM toolkit)

Useful: This criterion **CAN BE INCLUDED** in the framework for a PBM toolkit)

Unnecessary: This criterion must **BE EXCLUDED** from the framework for a PBM toolkit)

This first round of the Delphi survey will require 1-2 hours of your time. Thank you for your time and contribution.

Why PBM implementation is needed in South Africa?

SECTION A: The importance of PBM implementation in South Africa and the need for a PBM toolkit.

This section deals with the reasons why PBM implementation is important in South Africa and why a PBM toolkit is needed.

1. How would you rate the following reasons for why PBM implementation is important in South Africa

It is a holistic healthcare approach.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

It can improve the healthcare of the nation.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

It is based on patient focused outcomes.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

It protects patients' rights and safety.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

It supports a preventative healthcare paradigm.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

It will improve women and children's health.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

It is a quality improvement healthcare approach.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

It is a practical approach to address the high prevalence of anaemia.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

It offers opportunity for early detection & correction of anaemia.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

PBM is not only about surgery; it has a wide healthcare reach.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

It is an opportunity to change mindsets and historic practices of doctors with regards to blood transfusions.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

It is an approach to conserving donor blood which is a scarce resource.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

It encourages rational blood use thus preventing unnecessary transfusions.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

It can reduce morbidity & mortality.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

It is a means to avoid and reduce transfusion adverse effects.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

It encourages research driven improved clinical practices.

☐ Essential ☐ ☐ Unnecessary

Comment

It would make doctors more vigilant about their clinical approach to anaemia prevention and treatment.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

It offers financial benefits to patients and the healthcare system.

☐ Essential 70% ☐ Useful 30% ☐ Unnecessary

Comment

PBM implementation is achievable and South Africa can do it.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Implementation of PBM Pillar One is a good enough start for South Africa.

☐ Essential ☐ Useful ☐ Unnecessary

Comments

- Given the severe resource constraints in the country, I can see that focusing on Pillar One would be useful but we should not stop there.
- Much of pillars 2 and 3 are being done anyway - at least in major surgery units in the private sector. The other major target must be abandonment of numerical Hb targets.
- I agree that pillar one is where the initial focus should be, and where the biggest gains can be made. The other pillars should not be completely neglected though.
- All pillars should be aimed for in the implementation of PBM.
- I agree that this is the most practical part of PBM to start with.
- We must just not through the other pillars aside

Need for a PBM toolkit in South Africa.

In professional education, a 'toolkit' is defined as a resource that helps a professional improve his or her competence knowledge, or skills. For the purpose of this study, a PBM toolkit will comprise a host of guidance resources serving as tools to aid clinicians in detecting and managing anaemia, bleeding and blood loss in patients.

2. How would you rate the following reasons why a PBM tool kit is needed in hospitals in South Africa?

A toolkit will help to jumpstart PBM implementation in South Africa.

☐ Essential ☐ Useful ☐ Unnecessary

Comments

- PBM is an easy concept to sell but is often being done in an ad hoc / piecemeal way
- It must be available and be promoted.

A toolkit will serve as a driver to align clinical practices to the pillars of PBM.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

A toolkit will make PBM practically doable.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

It will serve as a quality improvement approach to patient care and overall healthcare.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

A toolkit will enable the empowerment of healthcare workers by creating better awareness and improved knowledge of PBM.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

It will serve as an educational platform for continuous medical education.

☐ Essential 60%

☐ Useful 40%

☐ Unnecessary

Comment

It will encourage clinically appropriate practices.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

A toolkit will provide guidance and support for junior doctors.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

It will provide quick clinical guidance as needed in a time constraint working environment.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

It will encourage accountability in clinical decision-making.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

- If it easily accessible and can be updated

It will help to change the historic culture of inappropriate transfusion practices.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

It will encourage the use of blood conservation approaches.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

It will serve as encouragement for application of best practice recommendations.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

SECTION B: Audit and Monitoring of blood usage in hospitals.

This section deals with the need to audit and monitor blood usage in hospitals and how best this should be done.

3.1 How would you rate the need to monitor / audit the use of blood and blood products in hospitals?

☐ Essential ☐ Useful ☐ Unnecessary

Comment

3.2. Who should monitor the usage of blood products?

	Essential	Useful	Unnecessary
Blood Services.	☐	☐	☐
Hospital management.	☐	☐	☐
Transfusion practitioner appointed for the hospital.	☐	☐	☐
Hospital appointed transfusion/ PBM nurse.	☐	☐	☐
Blood users committee/PBM committee/Hospital transfusion committee.	☐	☐	☐
Heads of each department.	☐	☐	☐
Department of Health.	☐	☐	☐

Comments

- My answers were influenced by what I thought would be practical and doable
- Co-operate process between a designated person / entity in the hospital and blood transfusion services. Very important that the lines of responsibility are clear to avoid a "he said, she said" situation
- Monitoring by the blood service and a committee in each hospital with a transfusion practitioner from the committee, on a rotational basis would be ideal.
- While it would be extremely useful to have dedicated transfusion practitioners appointed at each hospital site, I don't think this is realistic due to limited resources.
- The Blood Services have the stats to provide to the users. The DOH can end up focusing on irrelevant ratios.

PBM tools appropriate for Primary, Secondary and Tertiary level healthcare facilities.

SECTION C: Guidance resources needed as tools for a PBM toolkit appropriate for primary, secondary and tertiary level hospitals/healthcare facilities respectively in South Africa .

This section deals with selecting the essential, cost-effective, feasible, best practice, evidence based measures and resources as clinical practice tools for a PBM toolkit appropriate for Primary, Secondary and Tertiary level hospitals/healthcare facilities in South Africa.

Please rate the importance of the following as tools for a PBM toolkit appropriate for PRIMARY, SECONDARY and TERTIARY LEVEL hospitals/healthcare facilities respectively.
Tools for a PBM toolkit may be in the form of guidelines, standard operating procedures, diagrams, educational material, recorded lectures, posters, videos, case scenarios, information alerts, etc.)

4.1 ANAEMIA FOCUS TOOLS.

4.1.a. Tools for detection and management of anaemia.

Anaemia detection algorithms/flowcharts.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- A simple algorithm is universally applicable
- Many disciplines in tertiary hospitals need help with diagnosing anaemia

Flowcharts for the selection of the appropriate laboratory tests (When to order what tests?).

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Identifying the underlying causes of anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Treating underlying causes - anaemia management algorithms with scenarios wherever possible.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary	☐	☐	☐

Comment

List of drugs that cause anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

One often needs to look at drugs the patient's context, rather than just labeling some drugs as "causing anaemia".

When to refer patients for further evaluation.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

4.1.b. Iron deficiency anaemia diagnosis and treatment tools - Advice on the following:

The importance of serum ferritin screening on patients.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Information on the use and interpretation of iron studies.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Fasting samples must be taken for reliable iron study results.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- I was not aware that this was necessary. I would be concerned that this may preclude testing in people who present for work-up and that they could be lost to follow up. *Comment VR: Valid point. This question will be removed from Round 2 of the survey.*
- Many disciplines in tertiary hospitals need help.

Prescribing oral iron: How and when it should be taken.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- Many disciplines in tertiary hospitals need help.

Monitoring patients on oral iron treatment.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Information on prevention and management of the side effects of oral iron.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

4.1.c IV Iron Tools

Demystify IV iron use – Provide scientific basis that argue the myths.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- Although administration of IV iron at a primary healthcare level is a standard of care worldwide, I suspect it will require referral to a secondary facility in our state sector
- I assume that IV therapy would only be accessed at secondary and tertiary facilities so this information should be focused at these sites so as not to overwhelm patients. I would suggest a brief description of IV iron therapy in tool kits for primary facilities, but not too detailed.
- Many disciplines in tertiary hospitals need help

Indications for IV iron.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- I assume that IV therapy would only be accessed at secondary and tertiary facilities so this information should be focused at these sites so as not to overwhelm patients. I would suggest a brief description of IV iron therapy in tool kits for primary facilities, but not too detailed.
- Many disciplines in tertiary hospitals need help

IV iron - administration, timing and dosage.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- I assume that IV therapy would only be accessed at secondary and tertiary facilities so this information should be focused at these sites so as not to overwhelm patients. I would suggest a brief description of IV iron therapy in tool kits for primary facilities, but not too detailed.
- Many disciplines in tertiary hospitals need help

IV iron-Preventing and managing adverse events.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- I assume that IV therapy would only be accessed at secondary and tertiary facilities so this information should be focused at these sites so as not to overwhelm patients. I would suggest a brief description of IV iron therapy in tool kits for primary facilities, but not too detailed.
- Many disciplines in tertiary hospitals need help

Digital forms to simplify the motivation for IV iron to funders.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- This is dependent on setting of work. Important for private practice. Much less so in public sector, as IV iron is available on the EDL. In the Free State IV iron is available on primary clinic level.
- Again, I assume IV iron therapy would only be available in secondary and tertiary facilities.
- Many disciplines in tertiary hospitals need help

4.1.d. HIV related anaemia tools

Simplified diagnostic approach to anemia in HIV-infected individuals.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Risk factors associated with anaemia in HIV infection (*history of clinical AIDS, CD 4 cell count of 200 cells/ml, plasma viral load, women, Zidovudine use, increasing age, lower body mass index, history of bacterial pneumonia, oral candidiasis, history of fever, etc.*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐

Tertiary healthcare setting	☐	☐	☐

Comment

The major causes of HIV related anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Drugs that commonly cause myelosuppression in HIV-infected patients.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Identify and correct the treatable causes of anemia in HIV-infected patients.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Manage anaemia of inflammatory disease (previously termed anaemia of chronic disease) as a cause of HIV related anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- Realistically this may be beyond the scope of a primary health care practitioner. Again a space where telemedicine can be utilised
- I am not familiar with current thinking regarding the management of anaemia of inflammatory disease and if this should be done at a secondary healthcare facility.

Vigilance in the treatment of opportunistic infections to which HIV positive patients are susceptible that can lead to anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Malignancies that can lead to anemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- This would overcomplicate - malignancy should be noted in general as a potential cause of anemia. Not necessary to specify deeper.
- Many disciplines in tertiary hospitals need help

What are the current treatment guidelines for anemia in HIV-infected persons.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Interpretation of iron studies in HIV patients.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

Would ferritin studies be performed at primary healthcare facilities?

Comment VR: Please provide your opinion based on whether primary care healthcare workers should be able to interpret iron studies for HIV patients if these were available to them.

Use of HAART (Highly Active Antiretroviral Therapy) - the impact of various HAART regimens on anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Anaemia in the HIV population should never be regarded as "normal" and a patient who continues to be anaemic after effective ART should be investigated for other causes of the anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

Use of recombinant erythropoietin such as erythropoietin alfa.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- EPO hardly used at primary care level
- Due to the expense of EPO, I assume that it would only be used in tertiary settings.

Considerations for blood transfusion in patients with the HIV related anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- I think this information should be reserved for secondary/tertiary facility toolkits so as not to overwhelm primary facility staff.

30% of patients living with HIV can have a positive Coombs test. Positive Coombs test makes crossmatching difficult so that only the “least incompatible” blood can be issued. The importance of weighing the risk of transfusing “least incompatible” needs to be considered.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- I think this information should be reserved for secondary/tertiary facility toolkits so as not to overwhelm primary facility staff.

4.2 Policies/protocols/standard operating procedures needed as tools

Anaemia management protocol.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Diagnosis of anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Screening for anaemia protocol.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Pre-operative anaemia optimization protocol.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- The primary healthcare setting is the optimal one for diagnosis of anaemia and institution of anaemia therapy

Pre-operative evaluation for bleeding risk.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- Not all primary care centres provide surgical treatment
- Most doctors do this really badly. **Comment VR:** Consider primary care clinics that do operative procedures.

Intra-operative coagulation assessment.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- This should include clinical parameters like site, type and timing of bleeding and whole blood clotting time for under resourced areas
- Most doctors do this really badly

Post-operative assessment of bleeding risk.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- Again largely history and clinical observation

Management of anticoagulants in the peri-operative period.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Bridging anticoagulation guidelines.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- Bridging is overused and a real cause of post-operative bleeding. Very few absolute indications for bridging any more

Use of point-of-care coagulation testing and interpretation, e.g TEG, ROTEM.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- Sadly, unlikely that visco-elastic testing will be available widely in the secondary setting. But "poor man's TEG - INR / PTT / fibrinogen & platelet count is
- Point-of-care coagulation testing is unfortunately often venerated as the as the holy grail of haemostasis. It has only been validated in a few settings

Massive bleeding (general): Massive haemorrhage protocol.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- Step 1 of protocol - commence volume resuscitation, control obvious bleeding, administer TXA and expedite transfer to resourced facility

Management of postpartum haemorrhage.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Point-of-care coagulation testing.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment ☐

- POC coagulation testing should only be used in the context of a protocol about how to react to specific results. (Stanworth et al 2022)

Management of trauma associated haemorrhage.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Blood ordering, blood product indications and blood usage policy.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- Blood products are not issued to primary healthcare facilities in the Western Cape (I assume that this is the same in the rest of the country), so this information is not essential to these staff members.

Cardiac surgery associated haemorrhage.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- Cardiac surgery only offered at tertiary levels
- Cardiac surgery would only be performed at tertiary level hospitals.
- Often not evidence-based

Discipline specific PBM / transfusion guidelines.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- Ideally attempt a uniform approach to surgery. Obstetrics and cardiac surgery may require small addenda relating to fibrinogen and platelet counts / function. Medical patients clearly require a different approach - at least as far as interpretation of ferritin results is concerned

Guidelines for blood ordering at hospitals with no onsite blood banks.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Blood conservation approaches.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Blood management at hospitals with no onsite blood banks.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- As in question above on "guidelines for blood ordering...", tertiary settings will usually have an onsite blood bank.
- This information would be useful to primary healthcare facilities, as the patient might present to them prior to being transferred

How to use point-of-care equipment - Do's and Don'ts.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- Please involve pathology laboratories who specialize in the selection, maintenance and logistics of diagnostic instruments

TEG protocol.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- TEGs not usually done at district hospitals
- I assume TEG equipment is only available at tertiary facilities?
- Viscoelastic haemostatic assays (VHA) outside an institutional protocol of how to interpret and respond to specific readings are pointless (Choosing Wisely)

Guidelines for when to refer patients to the Haematologist.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Guidelines for when to refer patients to the Gastroenterologist.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Guidelines for when to refer patients to the Gynaecologist.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Guideline for management of cancer related anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Policy for the management of HIV related anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

4.3 Tools for a complete care paradigm for women.

Guidelines for monitoring iron levels in obstetric patients.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

Management of iron deficiency in obstetric patients.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

Checking iron levels 6 weeks postpartum.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

Would iron (ferritin) testing be performed in primary healthcare facilities?

Comment VR: Yes it can be done but due to financial limitations some clinics and even hospitals do not do it.

Post-operative iron protocol for Cesarean sections.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

Guideline for PBM in obstetric bleeding emergencies.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

Checking iron and ferritin levels following treatment of anaemia caused by heavy menstrual bleeding.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐

Tertiary healthcare setting	☐	☐	☐

Comments

- Can ferritin testing be requested from primary healthcare/nurse driven clinics?
- Comment VR: It depends on local rules; in some facilities yes and some no.

Guidelines for referral of patients for workup of anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

Iron treatment in pregnancy protocol.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

4.4 Tools for minimizing iatrogenic blood loss

Microsampling / microbleeding (smaller volume blood sample collection) benefits.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- While this is beneficial to the patient and forms part of the PBM principles, will the standard laboratories accept smaller sample volumes? Would there be an increase in the availability of POC testing?
- Comment VR: This can be achieved through collaboration with the laboratories and it is in practice in certain facilities.

Avoiding unnecessary repeat laboratory testing.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

4.5 Tools for pre-operative, intra-operative and post-operative patient care. Advice on:

Pre-operative anaemia optimization.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- The single most critical intervention and the lowest hanging fruit
- These patients would not be screened or followed up at primary healthcare facilities, so while the information is useful to the primary care staff, I would exclude it to keep the toolkit as focused as possible.

Management of iron deficiency anaemia in surgical patients (Pre-op, intra-op and post-op).

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

These patients would not be screened or followed up at primary healthcare facilities, so while the information is useful to the primary care staff, I would exclude it to keep the toolkit as focused as possible.

Post-operative patient care guidelines.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- These patients would not be screened or followed up at primary healthcare facilities, so while the information is useful to the primary care staff, I would exclude it to keep the toolkit as focused as possible.

Surgical considerations (haemostasis, lowering blood pressure, normothermia).

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐

Tertiary healthcare setting	☐	☐	☐

Comment

- Would hope we are all doing this in the tertiary sector at least.

Meticulous haemostasis and surgical techniques.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- The surgeons will be offended but many are neglecting this.

Blood sparing surgical techniques.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Anaesthetic blood conserving strategies.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Vigilant monitoring and management of post-operative bleeding.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Preventing secondary post-operative haemorrhage.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Avoid/treat infections promptly.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- We do need to be cautious not to undertake a guideline on all aspects of peri-operative care but to mention the critical reciprocal interactions between anaemia and sepsis / kidney injury / adverse cardiac events and prolonged hospital stay

Indications and contra-indications for intraoperative/ postoperative autologous blood collection and re-transfusion.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Use of autologous blood donation.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- This has become a forgotten child of PBM.
- I think this requires more discussion with the blood collection services, as we may not realistically be able to increase capacity of autologous donations. We cannot promote this service actively if it is not feasible.

Cell salvage protocols.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- Is cell salvage equipment available at secondary healthcare facilities?

Comment VR: Cell salvage equipment is available mainly in tertiary facilities; however there are a few regional hospitals with cell salvage equipment.

Videos on cell salvage methodology.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Bleeding assessment tools.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- This would be useful in primary healthcare settings too, if relevant (prior to transfer).

Bleeding management tools.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- This would be useful in primary healthcare settings too, if relevant (prior to transfer).

Blood loss formula calculator for predicting blood loss.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐

Tertiary healthcare setting	☐	☐	☐

Comment

List of medications and supplements that cause bleeding.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Screening patients that are at high risk for bleeding.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- This will be based largely on history. Avoid laboratory screening in the absence of a positive history.

Monitoring patients on anticoagulant/anti-platelet therapy.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- INR monitoring would be performed in primary healthcare facilities, so this knowledge would be useful for these clinics.

Limiting dilutional coagulopathy - Guidance on crystalloid use and dangers of over use.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Early post-operative feeding versus upper GI haemorrhage prophylaxis.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Use of erythropoietin.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- I presume that EPO would only be available in tertiary facilities due to resource constraints.

Use of aprotinin.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- If only to relegate it to the annals of history.
- Presumably only available in tertiary setting? I am not familiar with availability and usage in South Africa.
- Aprotinin has been removed from the market.

Use of tranexamic acid.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- Critical!!!
- Is tranexamic acid available and administered in primary healthcare settings?

Comment VR: Yes, it should be available at all levels of healthcare facilities.

Optimize cardiac output.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- What exactly would be covered by this? May be useful in primary healthcare setting for initial management of unstable patients prior to transfer.

Comment VR: This statement and the four that follow, all refer to PBM Pillar 3: Tolerate anaemia and harness and optimize physiological reserves.

In tolerating anaemia, it is important to optimize the patient's physiological reserve to respond to anaemia by identifying and managing any comorbidities. Patient-specific blood management plans should include restrictive transfusion strategies, addressing factors that may increase oxygen demands, for example fever and tachypnoea. Early attention to facilitating erythropoiesis to restore the red cell volume may be indicated. Measures recommended for pillar 3 include: Putting the patient on oxygen, ensuring bed rest, managing their Hb where necessary, treating underlying conditions, whether cardiac or respiratory (Isbister, 2013).

Optimize ventilation and oxygenation.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- Ventilation not usually done at PHC
- What exactly would be covered by this? May be useful in primary healthcare setting for initial management of unstable patients prior to transfer. **Comment VR:** Please refer to comment above.

Optimize anaemia reserve.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- What exactly would be covered by this? May be useful in primary healthcare setting for initial management of unstable patients prior to transfer. **Comment VR:** Please refer to comment above.
- I think that most of these interventions are encompassed by maximisation of oxygen reserve

Maximize oxygen delivery.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- What exactly would be covered by this? May be useful in primary healthcare setting for initial management of unstable patients prior to transfer. **Comment VR:** Please refer to comment above.
- Encompasses Hb quantity and quality; cardiac output; quality of extraction and oxygen uptake.

Minimize oxygen consumption.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- What exactly would be covered by this? May be useful in primary healthcare setting for initial management of unstable patients prior to transfer. **Comment VR:** Please refer to comment above.

Prescribing pain medication with considerations for bleeding risk e.g. NSAIDS, aspirin, etc.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

4.6 Transfusion decision making tools

Products, services and testing offered by the Blood Services.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- My recommendations is influenced by the knowledge that blood utilization in the public sector is already restrictive with very little clinical wastage.
- Blood products are not issued to primary healthcare facilities, to my knowledge.

Comment VR: Rural district hospitals have access to emergency blood stocks in dedicated fridges in the hospitals. Some larger district hospitals in urban areas have emergency medicine specialists and they do order blood and blood products.

Transfusion risks and hazards.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Cost of blood and blood products, including surcharges and levies for emergency and out of hours testing and services.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Restrictive transfusion thresholds.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Critical throughout all sectors.

Single unit transfusion focus - transfuse and assess strategy.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

4.7 Tools to assist hospitals in setting up PBM programs

Guidelines for setting up healthcare setting appropriate PBM program.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Primary healthcare facilities could have programs for the early identification and management of anaemia, and when to refer patients.

Self-audit guidelines and checklists.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Would be ideal if all facilities used a universal approach to PBM implementation and audit approach.

PBM readiness checklists for hospitals to serve as a needs analysis.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Setting metrics/targets – measures to see if set PBM targets are being met.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- Very important to motivate PBM practices (especially demonstration of cost-saving).
- The targets have to be realistic and attainable, otherwise they become a weapon used by managers

Transfusion control measures – control measures for when patients should be transfused to ensure patients are transfused only when clinically necessary.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

PBM checklists for patient history taking e.g. Has the patient had a full blood count in the last six weeks, has the patient had an iron study, does the patient have the following symptoms, did the patient bleed intraoperatively? How much do you think the patient bleed? Postoperative bleeding?

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- Post-operative anaemia is often the forgotten orphan of PBM.
- Very useful, but concerned that the clinicians would be overwhelmed with the number of templates and checklists.

Easy access templates for hospitals to write their PBM related protocols.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- This would hopefully encourage implementation.

Templates/checklists to identify bleeding risk.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- Very useful, but concerned that the clinicians would be overwhelmed with the number of templates and checklists

Laboratory tools – List of tests to request for bleeding disorders.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- Very useful to limit costs and blood loss from sampling for the patient.
- Would primary facility healthcare workers be able to request these tests?

Comment VR: It depends on local rules; in some facilities yes and some no.

Laboratory tools – List of tests for detection of anaemia and when to request what tests.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- Very useful to limit costs and blood loss from sampling for the patient.
- Would primary facility healthcare workers be able to request these tests?

Comment VR: It depends on local rules; in some facilities yes and some no.

Laboratory awareness tools - What do elevated and/or decreased test results mean.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- Telemedicine assistance for primary care environment.
- This is important to empower staff to manage the patient correctly and avoid unnecessary testing.

Guidance on how to set up pre-operative anaemia and bleeding clinic.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

I presume the pre-operative anaemia clinics would happen at the same facility where the operation would be taking place, rather than a primary healthcare facility? *Comment VR: Yes, that is correct.*

Referenced literature providing evidence base for PBM implementation in South Africa, low and middle-income countries and global.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- This will help provide credibility for any toolkit.

How to set up hospital transfusion committee/blood user committee/PBM committee.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Standing meeting agenda templates for hospital transfusion committee/blood user committee/PBM committee meetings.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- Allows uniformity in auditing of PBM practices.

Committee representation guidelines for hospital transfusion committee/blood user committee/PBM committee.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Standardized blood accountability forms.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Comprehensive informed consent documents for blood transfusion.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Code of conduct for ordering and administering transfusions.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Audit tools (How to carry out an audit e.g. transfusion use, iron reactions, etc).

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- Would audits realistically be carried out in primary healthcare facilities? *Comment VR: Why not?*

Implementing electronic blood ordering systems.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- This would be very useful but is this feasible to implement?
- Can only be implemented when the hospital has an electronic management system.

Guidance on how to implement policies/protocols/guidelines.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

3.8 Other tools.

Blood ordering form should include questions on whether alternate approaches other than transfusion have been considered for the patient.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- This would be very useful but is this feasible to implement?
- Can only be implemented when the hospital has an electronic management system.

Blood usage/monitoring dashboard (one could login to a common portal and view blood usage of hospitals).

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- This is a great idea.
- This can only be done if hospital have electronic system, unless the blood services offer it.

Share PBM success stories (local and global).

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- To encourage other sites.
- This would be important for buy-in from the hospitals.

Questions and Answers platform e.g. PBM *WhatsApp* group.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment: These can also be easily abused.

Information alerts giving updates on changes in clinical practices or changes in protocols/procedures.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

5. How would you rate the importance of the following PBM modalities in PRIMARY, SECONDARY and TERTIARY healthcare facilities respectively in South Africa?

Oral iron

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- Oral iron must remain the cornerstone for management of ID but knowledge is lacking.

IV iron

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

- I am not familiar with the costs of IV iron and whether wide roll-out is possible.

Erythropoietin

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- EPO not usually given at PHC.
- Is EPO affordable in South Africa?

Tranexamic acid.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Intra-operative normovolaemic haemodilution.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- This information would be useful for healthy patients undergoing elective procedures.
- It does not have much evidence.

Cell salvage equipment.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

What percentage of hospitals in South Africa have access to cell salvage equipment? **Comment VR:** This is uncertain; it would be an interesting study.

Optimizing anaemia before elective surgery.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Single unit transfusions.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Blood accountability forms.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Motivation for blood transfusion.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Point-of-care testing (POCT) Haemoglobin.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

POCT Haematocrit

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

POCT INR

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Is this available in South Africa? Can healthcare facilities afford this testing and is it accurate?

Comment VR: They are not widely used in our facilities. Costs can vary; sometimes the cost per POC test may work out more than the traditional laboratory test. Accuracy will be dependent on the user as well as calibration, quality control and maintenance of the devices.

POCT Platelet Function

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Is this available in South Africa? Can healthcare facilities afford this testing and is it accurate?

These instruments are overrated and give a false sense of security unless used in specific settings.

Comment VR: Yes this is available in South Africa and are used in some facilities. Accuracy will be dependent on the user as well as calibration, quality control and maintenance of the devices.

POCT intra-operative coagulation monitoring (e.g. ROTEM or TEG)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- TEGs not available at PHC.
- Is TEG widely available in South Africa? I understand that there are many benefits to TEG but I am not sure whether hospitals have access to this equipment.

- VHA, not the alpha and omega. They need to be implemented wisely with an evidence base.

Comment VR: TEGs are available in South Africa; mainly tertiary level hospitals.

6. Toolkit look & feel: Please rate the following options in terms of how the toolkit should be made available for practical access and use.

	Essential	Useful	Unnecessary
All-inclusive package including videos, diagrams, lectures/podcasts, policies, procedures, templates, etc.	☐	☐	☐
Digital / electronic toolkit with all of the above.	☐	☐	
Physical/Paper based toolkit with all of the above.	☐	☐	☐
Should be a combination of Digital and Physical.	☐	☐	
Should be in a poster format.	☐	☐	☐
There should be separate toolkits for public and private sector hospitals.	☐	☐	☐
There should be a PBM toolkit specific for nurses.	☐	☐	☐

Comments

- Ideally all data available electronically with individual posters on anaemia detection and correction; intra-operative PBM interventions; post-operative anaemia management.
- There should be layers. The nutshell of diagrams and algorithms first, with more if someone needs more. Digital first, physical second.

PBM education deficiencies and education failures that need to be addressed.

SECTION D: PBM education deficiencies and education failures.

*This section deals with the PBM knowledge deficiencies that need **to be addressed amongst the various stakeholder groups, including existing education failures.***

7.1 Please rate the importance of addressing the following PBM knowledge deficiencies amongst **DOCTORS** and **NURSES** respectively

PBM education deficiencies

a. General aspects of PBM

PBM definition and benefits of PBM.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

PBM Pillars – What do they mean and how to apply them.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Multidisciplinary care paradigm.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Knowledge of haemostasis.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

- Just the basics.

Role of the nurse in PBM and importance of role empowerment.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Role of the laboratory in PBM.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Management and optimal use of resources in resource constraint healthcare settings.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

PBM education deficiencies and education failures that need to be addressed.

Addressing PBM education deficiencies

b. Anaemia workup and diagnosis

Anaemia is treatable.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Approaches to early diagnosis and treatment.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

When to order what laboratory tests.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Can nurses in primary healthcare settings order blood tests (without doctor's consent/instruction)? **Comment VR:** It depends on local rules; in some facilities yes and some no.

Understanding laboratory test results.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Nurses should be empowered to understand the results, especially if they are running pre-operative anaemia clinics.

Consequences of anaemia.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Medications that cause anaemia.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Consequences of iron deficiency anaemia on women and children.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Managing obstetric emergencies.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Addressing PBM education deficiencies

c. Blood Banking

Knowledge of blood and blood products and their indications.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Blood ordering – When to order what products.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Blood transfusion is not the first choice treatment for anaemia.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Cost of blood and blood products.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Cost of testing (various crossmatch types) including out of hours levies/surcharges.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Blood wastage - Blood Service and Health Service implications.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comments

- There is a difference in terminology here - wastage to medical professionals often means inappropriate use of blood products, whereas to blood banks, it means returned and discarded blood.

VR Comment: If blood is returned using the blood returnable basis (BRB) system, then there is no wastage if blood is returned within the prescribed time and if the temperature has been maintained.

Ordering blood on a returnable basis (BRB) benefits.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

- Not applicable in the Western Cape (there is no BRB system at WCBS).

Appropriate storage of blood and blood products.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Appropriate use of blood and blood products.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Difference between PBM and Blood Conservation.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

HIV related anaemia management.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Addressing PBM education deficiencies

d. Ethical aspects

Ethical aspects of the use of blood and blood products.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Process for informed consent.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

- **ESSENTIAL!!!**

Doing enough and what is best for patients – patient specific considerations.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Autonomy and patients' rights.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Medico-legal implications of inappropriate anaemia management.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Medico-legal implications of inappropriate blood transfusions.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Taking the time to give patients appropriate clinical advice.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Making time for patient education and empowerment.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Ethical imperative for PBM.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Addressing PBM education deficiencies

e. Clinical aspects

Clinically appropriate transfusion decision making (Moving away from knee jerk reactions to a more informed approach).

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Transfusion risks and hazards.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Restrictive transfusion thresholds.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Adequate assessment of patients – Taking proper history is important for PBM.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

How to administer and monitor blood transfusions.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Four hour rule (transfusion should not exceed four hours from start of the infusion).

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Early patient referrals.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Single unit transfusion practice.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Addressing PBM education deficiencies:

f. Blood conservation

Alternate approaches to anaemia management other than transfusion.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Autologous transfusion options.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Cell salvage.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

- Knowledge is essential provided the doctor has access to cell salvage equipment.

Addressing PBM education deficiencies

g. Surgical aspects

Pre-operative, intra-operative and post-operative patient care.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Pre-operative anaemia optimization.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Timing of surgery – When to delay surgery.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Use of tranexamic acid and other antifibrinolytics.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Addressing PBM education deficiencies

g. Oral iron and IV iron

Oral iron and IV iron – When to administer what.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

How to take oral iron e.g. dosing and scheduling.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Follow up of patients on oral iron.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Iron metabolism - role of hepcidin in iron absorption.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

IV iron myths - demystify use.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

IV iron - Dosage and administration.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

IV iron - Preventing and managing adverse events.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Addressing PBM education deficiencies.

h. Preventing iatrogenic blood loss

Taking smaller volume samples for laboratory testing (micro-sampling/micro-bleeding).

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Avoiding unnecessary repeat testing.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Benefits of Point-of-care testing (POCT).

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

TEG and ROTEM use and interpretation.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Addressing PBM education deficiencies

i. Bleeding and blood loss.

Identifying high risk patients.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Medications, herbs and supplements that increase bleeding risk.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Managing bleeding risk.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Managing patients on anticoagulant/anti-platelet therapy.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Effects of drug interactions.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

7.2 Please rate the importance of addressing the following PBM awareness aspects amongst management and administrative stakeholders such as hospital management, medical aids, and finance related stakeholders.

	Essential	Useful	Unnecessary
Role of management/leadership support in PBM.	☐	☐	☐
Comment			

Management and healthcare leadership roles in creating improved health culture.

☐	☐

Comment

Cost saving benefits associated with PBM.	☐	☐	☐
Comment			

Cost comparisons – Blood and blood products versus alternative approaches to treatment of anaemia (haematinics, pharmacological agents).

☐	☐	☐

Comment

Patient care benefits associated with PBM.	☐	☐	☐
Comment			

Community healthcare benefits associated with PBM.

☐	☐

Comment

Importance of ensuring availability of hematinics e.g. iron, B12 and folate.	☐	☐	☐
Comment			

Importance of ensuring availability of pharmacological/haemostatic agents.

☐	☐	☐

Comment

Patient education and empowerment

8. EDUCATION NEEDS FOR PATIENT EMPOWERMENT.

8.1 How would you rate the importance of creating a patient- centred culture?

☐ Essential

☐ Useful

☐ Unnecessary

Comment

8.2 Please rate the importance of addressing the following PBM awareness needs amongst patients.

	Essential	Useful	Unnecessary
Causes of anaemia.	☐	☐	☐
Comment			
Consequences of anaemia.	☐	☐	☐
Comment			
Symptoms and signs of anaemia.	☐	☐	☐
Comment			
Iron deficiency anaemia.	☐	☐	☐
Comment			
How to take oral iron.	☐	☐	☐
Comment			
Dealing with the side effects of oral iron.	☐	☐	☐
Comment			
Consequences of anaemia in pregnancy.	☐	☐	☐
Comment			

Consequences of anaemia in children.

☐☐☐

Comment

Basics of blood testing and blood results.

☐☐☐

Comment

Autonomy and patients' rights,

☐☐☐

Comment

General health awareness and taking ownership of health.

☐☐☐

Comment

Importance of seeking medical guidance from the right people.

☐☐☐

Comment

Change mindset of patients "Doctor always knows best" philosophy.

☐☐☐

Comment

Importance of proper informed consent for transfusion.

☐☐☐

Comment

Options for patients who refuse blood transfusions.

☐☐☐

Comment

8.3 Approaches to educating and empowering patients.

8.3.1. Please rate the value of the following approaches to aid in creating better awareness of anaemia amongst patients.

	Essential	Useful	Unnecessary
Information campaigns by healthcare workers/healthcare organizations.	☐	☐	☐
Comment			
Use of radio power.	☐	☐	
☐ Comment			
Use of social media.	☐	☐	☐
Comment			
Make available language appropriate information booklets for patients.	☐	☐	☐
Comment			
Patient education and empowerment talks.	☐	☐	☐
Comment			
Asking doctors questions about treatment options.	☐	☐	
Comment			
Medical aids serving as a voice to educate patients.	☐	☐	☐
Comment: <i>Worried about conflict of interest here</i>			
Patients empowering patients with information.	☐	☐	
Comment: <i>Worried about incorrect information</i>			

Digital education
app. for patients.

☐☐☐

Comment

Videos and posters
in waiting rooms
(primary, secondary
and tertiary
healthcare facilities).

☐☐☐

Comment

Community
healthcare workers
providing education
in the respective
communities.

☐☐☐

Comment

Sharing of patient
stories (eventful and
uneventful).

☐☐

Comment

Online education
E.g. YouTube type
videos.

☐☐☐

Comment

9. Please rate the importance of addressing the following education failures that impact PBM implementation in hospitals in South Africa.

Lack of support from hospital management.

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Lack of support for PBM from Heads of Department impacting intern training and practice.

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Linear type medical education culture where education is mainly knowledge or theoretically focused rather than being practical or application focused.

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Lack of PBM education in undergraduate medical education for doctors.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of PBM education in undergraduate medical education for nurses.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of PBM education in postgraduate education for doctors.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of PBM education in postgraduate education for nurses.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of education on good clinical transfusion practices in undergraduate medical education.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of education on good clinical transfusion practices in postgraduate medical education.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Absence of accredited PBM training programs in South Africa and Africa.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Locally relevant PBM training content is needed.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of online self-learning PBM learning programs for South Africa.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of training on how to utilize healthcare resources optimally i.e. practicing in resource constraint settings.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Interns not attending scheduled PBM related training sessions.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

- The training sessions are often too detailed and over their heads. They are often working and cannot attend talks.

PBM training to empower nurses is lacking yet they are the 'ears and eyes of doctors.'

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Philosophical education approaches - therefore not translated in practice.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Education of the educators is needed.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Absence/lack of PBM education initiatives for administrative stakeholders such as medical aids, hospital management and finance stakeholders.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Pitch education at appropriate levels for the different categories of healthcare professionals.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Doctors should be taught by doctors, surgeons should be taught by surgeons, nurses be taught by nurses.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

SECTION E: Challenges and barriers to PBM implementation in South Africa and how a PBM toolkit may help with implementation.

This section deals with the need to address existing challenges and barriers that will help to enable PBM implementation in hospitals in South Africa.

10. Please rate the importance of addressing the following barriers and challenges to PBM implementation in South Africa.

Addressing barriers and challenges to PBM implementation

10.1 Awareness, education and buy-in.

PBM is perceived as overwhelming - it is more work for doctors.

☐ Essential

☐ Useful

☐ Unnecessary

Comment: It is less work for doctors.

Lack of PBM knowledge and awareness amongst healthcare workers across all settings (primary to tertiary healthcare levels).

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Awareness talks and initiatives attract the same individuals who are usually already on board with PBM. Awareness reach is not wide enough to target and get others on board.

☐ Essential ☐ Useful ☐ Unnecessary

Comments

- This is very true but changing. Need to have simultaneous top down (national strategy / legislation) and bottom up (patient empowerment)
- Strategies to increase practitioner exposure to PBM concepts.
- Short useful bits of PBM are needed.

Lack of PBM awareness amongst General Practitioners; yet GP environment is ideal for early diagnosis and correction of anaemia.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Nurses are often excluded from PBM awareness initiatives yet they have a key role to play in PBM.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

PBM awareness in primary healthcare clinics is very poor yet it is the ideal environment for early detection, correction of anaemia and early referral.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Community health workers are not educated on PBM; they are ideal partners to educate communities using language and level appropriate for various communities.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Absence/lack of PBM education during internship training phase of doctors.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of PBM guidance and support for doctors at all levels in hospitals.

☐ Essential ☐ Useful ☐ Unnecessary

Comments

- Resources are available and guidance freely available. Just need to encourage practitioners to think PBM.
- "A" should stand for airway AND anaemia in our patient approach.
- Guidance available in our institution to some degree. Don't have data on other levels of institutions.

It should be mandatory for doctors to attend a dedicated education/orientation training on good clinical transfusion practices before they can transfuse patients.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Limited access to advisory support from Haematologists in the private and public sector.

☐ Essential ☐ Useful ☐ Unnecessary

Comments

- All we need to do is ask.
- Depends on where you work

PBM has not formally been endorsed by key stakeholders (Department of Health, South African Medical Association, Medical Aids). Uptake is therefore poor.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of buy-in and support from senior leadership in hierarchical structures within hospitals.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Some specialties not on board with PBM. If you agree, please comment which...

☐ Essential ☐ Useful ☐ Unnecessary

Comments

- Surgery, Orthopaedics, Medicine, Obstetrics, Paediatrics, Anaesthesia.
- Internal medicine - far too much transfusion for stable anaemic patients; critical care - on board but much mythology of infectious potential of IV iron vs transfusion
- Orthopaedics - paradigm of transfusion to normal Hb pre and post-op; paediatrics - slow uptake of PBM.
- I am not aware of specialties specifically against PBM in our institution, but uptake not broad yet.
- Surgeons.

Private hospitals not on board with PBM.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.2. Culture of practice amongst doctors.

Longstanding/historic practice of prescribing blood transfusions for treatment of anaemia persists.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Ego of doctors - making transfusion practice changes difficult.

☐ Essential ☐ Useful ☐ Unnecessary

Comment: Especially in private practice.

Access to blood is easy. It is therefore an overused quick fix to correct anaemia.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Doctors are overworked; dealing with high patient numbers in public healthcare sector. Transfusion therefore often becomes the quickest and easiest approach to correct low haemoglobin levels in patients.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Doctors chase numbers when it comes to patients' haemoglobin levels.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Some consultants leave junior doctors without support with regards to transfusion practice.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Private healthcare culture – Doctors are not answerable and not open to be told what to do with regards to transfusion practice.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Focus is still on 'product' rather than 'patient.'

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Transfusion triggers vary amongst clinicians within the same discipline.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of multidisciplinary PBM approach in treating patients with anaemia.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Single unit transfusions (transfuse and assess strategy) in non-bleeding patients is not a culture of practice in most settings.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of surgical capability in district hospitals – Patients have to be referred causing delay in treatment.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Understanding of response time required for oral and IV iron to work.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Access to IV iron in all level hospitals.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of accountability.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.3 Finance related challenges.

Inadequate budget for laboratory screening tests. Anaemia goes undetected in certain patients at primary healthcare facilities and district hospitals preventing early treatment.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Silo budgets - Separate laboratory budget, blood budget, pharmaceutical budget etc. preventing certain good practices due to administrative controls e.g. spending a little more on the laboratory budget can result in savings on the blood budget.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Gatekeeping challenges placing restrictions on ordering of blood tests.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Insufficient funds to purchase Point of care testing devices.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Inadequate budget to cover costs associated with cell salvage including the cost of needed consumables.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

TEG – expensive to run tests.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Not enough budget to employ more hospital staff. Current staff are already overworked with little motivation to do more than they are already doing.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.4 Capacity - Manpower challenges.

No dedicated person (nurse/doctor) that takes control of PBM in a specific hospital.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

No transfusion practitioners in hospitals.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

No dedicated PBM nurses in hospitals.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Not enough PBM champions.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

No transfusion medicine specialists in hospitals in South Africa.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Not enough staff to run pre-operative anaemia clinics.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

No time to review blood accountability forms and monitor blood usage.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Backlog of surgical cases - Cannot delay surgery to optimize anaemia in patients.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Doctors spending time on administrative tasks due to lack of administrative support in public healthcare sector.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.5 Anaemia burden.

High anaemia prevalence in South Africa. Patients frequently present with anaemia and 'accepted' as a norm.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Prioritization of anaemia in non-surgical patients is poor.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Anaemia is often underdiagnosed and in some patients it goes undetected.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Not enough priority is given to treating the causes of anaemia.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Oral iron, and not blood transfusion should be the first modality for correcting iron deficiency - This is not a common culture of practice especially in hospitalized patients.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Oral iron is not always well tolerated by some patients - more tolerable iron preparations come at a higher cost.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Patients are not educated on how to take oral iron.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Pre-operative anaemia optimization is not a routine practice in hospitals.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Oversampling of patients/unnecessary repeat blood tests contribute to anaemia in hospitalized patients.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Use of smallest size blood collection tube practical for laboratory analysis is not a culture of practice.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Small size tubes are not always available for use in adult wards.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Primary healthcare facilities are under-resourced for early detection and correction of anaemia (Lack of staff, training, access to laboratory testing, inadequate stocks of oral iron, B12 injections in some facilities).

☐ Essential ☐ Useful ☐ Unnecessary

Comment

District hospitals not adequately geared for anaemia detection and management (Lack of staff, lab testing limitations) - These place burden on tertiary facilities when patients end up complicated.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Lack of patient-centered healthcare culture.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Patients not empowered and educated with regards to iron deficiency and the associated consequences.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.6 Logistical challenges.

Patients not referred early enough to allow for anaemia workup and treatment.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

No onsite Pathology laboratory in some public hospitals causing delays in laboratory testing.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Delays in receiving laboratory test results in the public sector.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Delay in anaemia diagnosis often lead to patients' condition having deteriorated by the time they get to tertiary facilities.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Patients go home before tests results are received, and with no treatment.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Patients travel long distances to tertiary care facilities.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Not enough hospital beds to admit patients while awaiting test results for proper diagnosis and treatment.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Patients return to healthcare facilities in worse off conditions.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Some patients never return for treatment / follow up.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Hospitals not having onsite blood banks - more blood is ordered as a safety measure to prevent transfusion delays.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.7 Department of Health.

Silo culture (independent operations and budget management) of health departments in the various provinces causing regional disparities.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of national policies/protocols to guide PBM related practices.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Primary health care facilities not optimally functional/resourced to apply the principles of PBM principles.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Poverty in society contributes to dietary insufficiencies thus contributing to the anaemia burden.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of attention given to the clinical significance of anaemia in the South African population.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.8 Policy challenges.

Not enough policies to guide practices e.g. anaemia, PBM, transfusion. (Please specify where necessary).

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of national policies e.g. anaemia, PBM, transfusion (Please specify where necessary).

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Absence of transfusion focus in the National Core Standards for Health Establishments in South Africa.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Access to policy makers to endorse policies is a challenge.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of guidelines on creating, changing and reviewing policies.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Fragmented policies – no standard blood transfusion policy in hospitals.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Poor/slow implementation of PBM protocols/policies in clinical practice.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Monitoring of compliance to policies is lacking.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

No specific guidance on PBM in Essential Medicine List guidelines.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lengthy guidelines - Simple stronger policies are needed.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of multidisciplinary collaboration in policy development.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Challenges getting timeous endorsement of policies by department of health at national level.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Challenges getting timeous endorsement of policies by department of health at provincial level.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Policies e.g. transfusion, PBM, anaemia, blood conservation should come from the Health Department and not the Blood Services.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.9 Infrastructure challenges.

Lack of space and infrastructure to set up anaemia clinics.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Absence of and/or dysfunctional computer systems and IT support for access to laboratory results is poor.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Absence of electronic blood ordering systems which can create alerts/warnings preventing unnecessary blood ordering.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Computer systems between hospitals and blood banks are not linked.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Lack of emergency medical transport services cause delay in transferring patients with bleeding and blood loss to secondary/tertiary facilities.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.10. Lack of general PBM resources/modalities in hospitals.

Hematinics in primary healthcare facilities not always available.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Blood warmers not available in most hospitals.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of cell salvage equipment.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Consumables for cell salvage devices not available.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Oral iron not readily available.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

IV Iron not readily available.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

IV Iron access and motivation processes are tedious in the private healthcare sector.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of comfort with IV iron use.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of validated devices for point of care testing e.g. POCT heamoglobin, haematocrit, INR).

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Point-of-care coagulation testing not available in theatres.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Tranexamic acid not available in some hospitals.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Erythropoietin not available in some facilities.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.11. General challenges.

Lack of hospital monitoring systems for blood usage - Dependence on Blood Services for blood usage data.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

No accountability measures for irrational use of blood and blood products including blood wastage.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Lack of proper informed consent process for transfusion.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Blood user committees either non-existent or not adequately functional.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Time challenges and/or poor commitment from members of blood users committee/hospital transfusion committee.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Blood requisition form does include questions on whether treatment options other than transfusion have been considered for the patient.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Blood requisition form does not ask for reasons why blood is being ordered for the patient.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Blood accountability forms are not used in all hospitals when ordering blood and blood products for patients.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Thank you very much for completing Round 1 of the Delphi survey. I will provide feedback on this round of the survey once all participant responses are submitted and analyzed. I will also communicate the details for Round 2 of the survey. Round 2 of the Delphi survey will be much shorter. I sincerely appreciate your time and contribution to this study.

General comments

LETTER TO DELPHI PANEL - ROUND TWO

Developing a validated framework for a Patient Blood Management (PBM) toolkit appropriate for the South African healthcare context

Dear Doctor/Professor

Thank you once again for your participation in the Delphi process and for the feedback given during Round One of the survey.

PURPOSE OF THE ROUND TWO QUESTIONNAIRE

In Round Two of the questionnaire you are provided with all the statements (criteria) on which consensus was **not reached** during Round One. Consensus was pre-defined according to the literature as the state where 80% of the participants vote on a specific item with the same value on the three-point scale.

INSTRUCTIONS FOR COMPLETION OF THE SECOND ROUND OF THE DELPHI SURVEY

Round Two questionnaire includes the statements on which consensus **COULD NOT** be reached in Round One. In this round, I have included the percentage response from the Panel in Round 1. This is by no means intended to coerce you into making a particular selection. According to Keeney et al (2006), it is only through seeing the (anonymous) responses from other panel members; participants are encouraged to reconsider their views. In this round of the Delphi process you are given the opportunity to reconsider your opinion on the statements that are left, taking into account the anonymous feedback that was provided by your fellow participants and some clarifications made by the researcher.

All sections and statements have been maintained in exactly the same manner as in the first round. Please click on the Survey Monkey link that has been included in the email to access the questionnaire.

Please use the following scale again:

1 = Essential (This criterion must **DEFINITELY BE INCLUDED** in the model)

2 = Useful (This criterion **CAN BE INCLUDED** in the model)

3 = Unnecessary (This criterion must **DEFINITELY BE EXCLUDED** from the model)

Please answer all questions in the questionnaire. Do not hesitate to contact me should you have any queries or concerns. The questionnaire in this round should take 30 – 60 minutes of your time.

As always, your response remains anonymous and confidential with regards to all other participants. Please complete the survey by the **21st November 2022**. The analysis can only be done once all participants have completed the survey; your cooperation is therefore greatly appreciated.

I sincerely thank you once again for your time, and the tremendous effort and input thus far.

Vanitha Rambiritch (Researcher)

PhD Student - University of Cape Town

Faculty of Health Sciences – Department of Medicine

Head of Learning and Development - KZN

South African National Blood Service.

References

Keeney S, Hasson F, McKenna H. Consulting the oracle: ten lessons from using the Delphi technique in nursing research. J Adv Nurs. 2006 Jan;53(2):205-12. doi: 10.1111/j.1365-2648.2006.03716.x. PMID: 16422719.

Delphi Survey Round 2: Developing a validated framework for a Patient Blood Management (PBM) toolkit appropriate for the South African healthcare context.

Welcome and introduction

Thank you for taking the time to participate in Round 2 of the Delphi survey.

By proceeding with the survey, it is accepted that you give informed consent to participate in this study. Your time, input and contribution is very much appreciated.

STUDY AIM: To develop a validated framework for a South African healthcare needs focused Patient Blood Management (PBM) toolkit encompassing the essential, cost effective, feasible, evidence based PBM guidance measures to serve as a template to inform the development of a clinical practice PBM toolkit for optimizing the care of patients and avoiding the inappropriate use of blood transfusions.

In professional education, a **‘toolkit’ is defined as a resource that helps a professional improve his or her competence, knowledge or skills.** For the purpose of this study, a PBM toolkit will comprise a host of guidance resources serving as tools to aid clinicians in diagnosing and treating anaemia, and managing bleeding and blood loss in patients. Tools for a PBM toolkit may be in the form of guidelines, standard operating procedures, diagrams, educational material, recorded lectures, posters, videos, case scenarios, information alerts, etc.

Please fill in your details below

Name

You have been selected to participate in this study based on your PBM knowledge and expertise and your active involvement in leading and guiding PBM implementation. Your opinion as a participant is sought on the relative importance of each criterion listed in the survey. Each statement must be evaluated in respect of its importance as an aspect or criterion that must be included in a framework to guide the development of a PBM toolkit appropriate for the South African healthcare environment.

This survey comprises five sections. You are required to rate each statement in every section as either:

Essential: (This criterion must **DEFINITELY BE INCLUDED** in the framework for a PBM toolkit)

Useful: This criterion **CAN BE INCLUDED** in the framework for a PBM toolkit)

Unnecessary: This criterion must **BE EXCLUDED** from the framework for a PBM toolkit)

This second round of the Delphi survey will require 30 - 60 minutes of your time. Thank you for your time and contribution.

Delphi Survey Round 2: Developing a validated framework for a Patient Blood Management (PBM) toolkit appropriate for the South African healthcare context.

The importance of PBM implementation in South Africa and the need for a PBM toolkit.

SECTION A: The importance of PBM implementation in South Africa and the need for a PBM toolkit.

This section deals with the reasons why PBM implementation is important in South Africa and why a PBM toolkit is needed.

1. How would you rate the following reasons for why PBM implementation is important in South Africa

It supports a preventative healthcare paradigm. *(70% of the participants selected ESSENTIAL; 30% selected USEFUL)*

☐ Essential ☐ Useful ☐ Unnecessary

Comment

It is a means to avoid and reduce transfusion adverse effects. *(60% of the participants selected ESSENTIAL; and 40% selected USEFUL)*

☐ Essential ☐ Useful ☐ Unnecessary

Comment

It encourages research driven improved clinical practices. *(50% of the participants selected ESSENTIAL; 50% selected USEFUL).*

☐ Essential ☐ Useful ☐ Unnecessary

Comment

It offers financial benefits to patients and the healthcare system. *(70% of the participants selected ESSENTIAL; 30% selected USEFUL)*

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Implementation of PBM Pillar One is a good enough start for South Africa *(60% of the participants selected ESSENTIAL; 20% selected USEFUL; 20% UNNECESSARY)*

☐ Essential ☐ Useful ☐ Unnecessary

Comment

In professional education, a 'toolkit' is defined as a resource that helps a professional improve his or her competence knowledge, or skills. For the purpose of this study, a PBM toolkit will comprise a host of guidance resources serving as tools to aid clinicians in detecting and managing anaemia, bleeding and blood loss in patients.

2. How would you rate the following reasons why a PBM tool kit is needed in hospitals in South Africa?

A toolkit will help to jumpstart PBM implementation in South Africa. *(60% selected ESSENTIAL; 40% selected USEFUL)*

☐ Essential ☐ Useful ☐ Unnecessary

Comment

It will serve as an educational platform for continuous medical education *(60% of the participants selected ESSENTIAL; 40% selected USEFUL)*

☐ Essential ☐ Useful ☐ Unnecessary

Comment

It will serve as a quality improvement approach to patient care and overall healthcare.*(60% of the participants selected ESSENTIAL; 40% selected USEFUL)*

☐ Essential ☐ Useful ☐ Unnecessary

Comment

It will encourage accountability in clinical decision making. *(60% of the participants selected ESSENTIAL; 40% selected USEFUL)*

☐ Essential ☐ Useful ☐ Unnecessary

Comment

SECTION B: Audit and Monitoring of blood usage in hospitals.

This section deals with the need to audit and monitor blood usage in hospitals and how best this should be done.

3.1. Who should monitor the usage of blood products?

	Essential	Useful	Unnecessary
Blood Services. (70% selected ESSENTIAL; 30% USEFUL)	☐	☐	☐
Hospital management. (60% selected ESSENTIAL; 40% USEFUL)	☐	☐	☐
Transfusion practitioner appointed for the hospital. (70% selected ESSENTIAL; 30% USEFUL)	☐	☐	☐
Hospital appointed transfusion/ PBM nurse. (50% selected ESSENTIAL ; 50% USEFUL)	☐	☐	☐
Heads of each department. (50% selected ESSENTIAL; 30% USEFUL; 20% UNNECESSARY)	☐	☐	☐
Department of Health. (40% selected ESSENTIAL; 30% USEFUL; 30% UNNECESSARY)	☐	☐	☐
Comment			

Delphi Survey Round 2: Developing a validated framework for a Patient Blood Management (PBM) toolkit appropriate for the South African healthcare context.

PBM tools appropriate for Primary, Secondary and Tertiary level healthcare facilities.

SECTION C: Guidance resources needed as tools for a PBM toolkit appropriate for primary, secondary and tertiary level hospitals/healthcare facilities respectively in South Africa .

This section deals with selecting the essential, cost-effective, feasible, best practice, evidence based measures and resources as clinical practice tools for a PBM toolkit appropriate for Primary, Secondary and Tertiary level hospitals/healthcare facilities in South Africa.

Please rate the importance of the following as tools for a PBM toolkit appropriate for PRIMARY, SECONADRY and TERTIARY LEVEL hospitals/healthcare facilities respectively.

Tools for a PBM toolkit may be in the form of guidelines, standard operating procedures, diagrams, educational material, recorded lectures, posters, videos, case scenarios, information alerts, etc.)

4.1 ANAEMIA FOCUS TOOLS.

4.1.a. Tools for detection and management of anaemia.

Anaemia detection algorithms/flowcharts (70% selected *ESSENTIAL*; 30% *USEFUL*)

	Essential	Useful	Unnecessary
Tertiary healthcare setting	☐	☐	☐

Comment

List of drugs that cause anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting (50% <i>ESSENTIAL</i> ; 50% <i>USEFUL</i>)	☐	☐	☐
Secondary healthcare setting (60% <i>ESSENTIAL</i> ; 40% <i>USEFUL</i>)	☐	☐	☐
Tertiary healthcare setting (60% <i>ESSENTIAL</i> ; 40% <i>USEFUL</i>)	☐	☐	☐

Comment

When to refer patients for further evaluation.

	Essential	Useful	Unnecessary
Secondary healthcare setting (70% <i>ESSENTIAL</i> ; 30% <i>USEFUL</i>)	☐	☐	☐
Tertiary healthcare setting (30% <i>ESSENTIAL</i> ; 50% <i>USEFUL</i> ; 20% <i>UNNECESSARY</i>)	☐	☐	☐

Comment

4.1.b. Iron deficiency anaemia diagnosis and treatment tools - Advice on the following:

Prescribing oral iron: How and when it should be taken (70% selected *ESSENTIAL*; 30% *USEFUL*)

	Essential	Useful	Unnecessary
Tertiary healthcare setting	☐	☐	☐

Comment

4.1.c IV Iron Tools

Please rate the following tools for a PBM toolkit

IV Iron tools for **PRIMARY HEALTHCARE FACILITIES**:

	Essential	Useful	Unnecessary
Demystify IV iron use - Provide scientific basis that argue the myths (50% <i>ESSENTIAL</i> ; 40% <i>USEFUL</i> ; 10% <i>UNNECESSARY</i>)	☐	☐	☐
Indications for IV iron (50% selected <i>ESSENTIAL</i> ; 50% <i>USEFUL</i>)	☐	☐	☐
IV iron: Administration, timing and dosage (60% <i>ESSENTIAL</i> ; 40% <i>USEFUL</i>)	☐	☐	☐
IV iron: Preventing and managing adverse events (60% <i>ESSENTIAL</i> ; 40% <i>USEFUL</i>)	☐	☐	☐

Comment

Digital forms to simplify the motivation for IV iron to funders.

	Essential	Useful	Unnecessary
Primary healthcare setting (30% ESSENTIAL; 50% USEFUL; 20% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (60% ESSENTIAL; 30% USEFUL; 10% UNNECESSARY)	☐	☐	☐
Tertiary healthcare setting (60% ESSENTIAL; 30% USEFUL; 10% UNNECESSARY)	☐	☐	☐

Comment

4.1.d. HIV related anaemia tools.

Risk factors associated with anaemia in HIV infection (history of clinical AIDS, CD 4 cell count, viral load, women, Zidovudine use, etc.) (60% selected ESSENTIAL; 40% USEFUL)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

The major causes of HIV related anaemia (60% selected ESSENTIAL; 40% USEFUL)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Drugs that commonly cause myelosuppression in HIV infected patients.(70% selected ESSENTIAL; 30% USEFUL)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Manage anaemia of inflammatory disease as a cause of HIV related anaemia (70% selected ESSENTIAL; 30% USEFUL)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Malignancies that can lead to anaemia (60% selected ESSENTIAL; 30% USEFUL; 10% UNNECESSARY)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Interpretation of iron studies in HIV patients (70% selected ESSENTIAL; 30% USEFUL)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Use of recombinant erythropoietin such as erythropoietin alfa.

	Essential	Useful	Unnecessary
Primary healthcare setting (10% ESSENTIAL; 60% USEFUL; 30% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (60% ESSENTIAL; 30% USEFUL; 10% UNNECESSARY)	☐	☐	☐

Comment

Considerations for blood transfusions in patients with HIV related anaemia (40% selected ESSENTIAL; 50% USEFUL; 10% UNNECESSARY)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

30% of patients living with HIV can have a positive Coombs test. Positive Coombs test makes crossmatching difficult so that only the “least incompatible” blood can be issued. The importance of weighing the risk of transfusing “least incompatible” needs to be considered.

	Essential	Useful	Unnecessary
Primary healthcare setting (30% ESSENTIAL; 50% USEFUL; 20% UNNECESSARY)	☐	☐	☐

Secondary healthcare setting (70% ESSENTIAL; 20% USEFUL; 10% UNNECESSARY)	☐	☐	☐

Tertiary healthcare setting (70% ESSENTIAL; 20% USEFUL; 10% UNNECESSARY).	☐	☐	☐

Comment

4.2 Policies/protocols/standard operating procedures needed as tools

Pre-operative anaemia optimization protocol. (40% selected ESSENTIAL; 30% USEFUL; 30% UNNECESSARY)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Pre-operative evaluation for bleeding risk. (40% selected *ESSENTIAL*; 20% *USEFUL*; 40% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Intra-operative coagulation assessment. (20% selected *ESSENTIAL*; 10% *USEFUL*; 70% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Post-operative assessment of bleeding risk. (30% selected *ESSENTIAL*; 10% *USEFUL*; 60% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Management of anti-coagulants in the peri-operative period. (20% selected *ESSENTIAL*; 40% *USEFUL*; 40% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Bridging anticoagulation guidelines. (10% selected *ESSENTIAL*; 30% *USEFUL*; 60% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Massive bleeding (general): Massive haemorrhage protocol. (50% selected *ESSENTIAL*; 10% *USEFUL*; 40% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Management of trauma associated haemorrhage. (70% selected *ESSENTIAL*; 10% *USEFUL*; 20% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Blood ordering, blood product indications and blood usage policy. (50% selected *ESSENTIAL*; 30% *USEFUL*; 20% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Blood conservation approaches. (40% selected *ESSENTIAL*; 10% *USEFUL*; 50% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Guidelines for when to refer patients to the Haematologist. (50% *ESSENTIAL*; 30% *USEFUL*; 20% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Use of point-of-care coagulation testing and interpretation, e.g TEG, ROTEM.

	Essential	Useful	Unnecessary
Primary healthcare setting (20% ESSENTIAL; 20% USEFUL; 60% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐
Comment			

Point-of-care coagulation testing.

	Essential	Useful	Unnecessary
Primary healthcare setting (30% ESSENTIAL; 10% USEFUL; 60% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐
Comment			

Cardiac surgery associated haemorrhage (20% selected ESSENTIAL; 60% USEFUL; 20% UNNECESSARY)

	Essential	Useful	Unnecessary
Secondary healthcare setting	☐	☐	☐
Comment			

Discipline specific PBM / transfusion guidelines.

	Essential	Useful	Unnecessary
Primary healthcare setting (20% ESSENTIAL; 20% USEFUL; 60% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (40% ESSENTIAL; 50% USEFUL; 10% UNNECESSARY)	☐	☐	☐
Comment			

Guidelines for blood ordering at hospitals with no onsite blood banks.

	Essential	Useful	Unnecessary
Primary healthcare setting (50% ESSENTIAL; 20% USEFUL; 30% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐
Tertiary healthcare setting (60% ESSENTIAL; 30% USEFUL; 10% UNNECESSARY)	☐	☐	☐
Comment			

Blood management at hospitals with no onsite blood banks.

	Essential	Useful	Unnecessary
Primary healthcare setting (60% ESSENTIAL; 30% USEFUL; 10% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐
Tertiary healthcare setting (60% ESSENTIAL; 30% USEFUL; 10% UNNECESSARY)	☐	☐	☐

Comment

How to use point-of-care equipment - Do's and Don'ts.

	Essential	Useful	Unnecessary
Primary healthcare setting (60% ESSENTIAL; 20% USEFUL; 20% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (70% ESSENTIAL; 30%)	☐	☐	☐

Comment

TEG protocol.

	Essential	Useful	Unnecessary
Primary healthcare setting (30% ESSENTIAL; 10% USEFUL; 60% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (50% ESSENTIAL; 50% USEFUL)	☐	☐	☐

Comment

Guidelines for when to refer patients to the Gastroenterologist.

	Essential	Useful	Unnecessary
Primary healthcare setting (40% ESSENTIAL; 40% USEFUL; 20% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐
Tertiary healthcare setting (60% ESSENTIAL; 30% USEFUL; 10% UNNECESSARY)	☐	☐	☐

Comment

Guidelines for when to refer patients to the Gynaecologist.

	Essential	Useful	Unnecessary
Primary healthcare setting (60% ESSENTIAL; 20% USEFUL; 20% UNNECESSARY)	☐	☐	☐
Tertiary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐

Comment

Guideline for management of cancer related anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting (10% ESSENTIAL; 50% USEFUL; 40% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (60% ESSENTIAL; 40% USEFUL)	☐	☐	☐

Comment



Delphi Survey Round 2: Developing a validated framework for a Patient Blood Management (PBM) toolkit appropriate for the South African healthcare context.

PBM tools for primary, secondary and tertiary healthcare settings .

4.3 Tools for a complete care paradigm for women.

Checking iron levels 6 weeks postpartum. (70% of the participants *ESSENTIAL*; 30% *USEFUL* for Primary and Tertiary facilities)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐
Comments			

Guidelines for referral of patients for workup of anaemia. (50% selected *ESSENTIAL*; 40% *USEFUL*; 10% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Tertiary healthcare setting	☐	☐	☐
Comments			

Checking iron and ferritin levels following treatment of anaemia caused by heavy menstrual bleeding. (70% selected *ESSENTIAL*; 30% *USEFUL*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Comments			

4.4 Tools for minimizing iatrogenic blood loss

Microsampling / microbleeding (smaller volume blood sample collection) benefits.

	Essential	Useful	Unnecessary
Primary healthcare setting (40% ESSENTIAL; 50% USEFUL; 10% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐
Tertiary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐

Comment

Avoiding unnecessary repeat laboratory testing (70% ESSENTIAL; 20% USEFUL; 10% UNNECESSARY).

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

4.5 Tools for pre-operative, intra-operative and post-operative patient care. Advice on:

Tools for pre-operative, intra-operative and post-operative patient care in **PRIMARY HEALTHCARE FACILITIES**. Advice on:

	Essential	Useful	Unnecessary
Pre-operative anaemia optimization (50% ESSENTIAL; 10% USEFUL; 40% UNNECESSARY)	☐	☐	☐
Management of iron deficiency anaemia in surgical patients (40% ESSENTIAL; 20% USEFUL; 40% UNNECESSARY).	☐	☐	☐
Post-operative patient care guidelines (40% ESSENTIAL; 20% USEFUL; 0% UNNECESSARY)	☐	☐	☐

Surgical

considerations
(haemostasis,
lowering blood
pressure,
normothermia).
(30% *ESSENTIAL*;
30% *USEFUL*; 40%
UNNECESSARY)

☐☐☐

Meticulous
haemostasis and
surgical techniques
(30% *ESSENTIAL*;
20% *USEFUL*; 50%
UNNECESSARY)

☐☐☐

Blood sparing
surgical techniques
(30% *ESSENTIAL*;
30% *USEFUL*; 40%
UNNECESSARY)

☐☐☐

Anaesthetic blood
conserving
strategies (30%
ESSENTIAL; 30%
USEFUL; 40%
UNNECESSARY)

☐☐☐

Vigilant monitoring
and management of
post-operative
bleeding (50%
ESSENTIAL; 10%
USEFUL; 40%
UNNECESSARY).

☐☐☐

Preventing
secondary post-
operative
haemorrhage (50%
ESSENTIAL; 10%
USEFUL; 40%
UNNECESSARY)

☐☐☐

Bleeding assessment
tools (60%
ESSENTIAL; 10%
USEFUL; 30%
UNNECESSARY)

☐☐☐

Bleeding
management tools
(50% *ESSENTIAL*;
20% *USEFUL*; 30%
UNNECESSARY)

☐☐☐

List of medications
and supplements
that cause bleeding
(60% *ESSENTIAL*;
20% *USEFUL*; 20%
UNNECESSARY)

☐☐☐

Screening patients
that are high risk for
bleeding (60%

☐☐☐

ESSENTIAL; 20%
USEFUL; 20%
UNNECESSARY)

Monitoring patients
on

anticoagulant/anti-
platelet therapy

(50% ESSENTIAL;
40% USEFUL; 10%
UNNECESSARY)



Limiting dilutional
coagulopathy -
guidance on
crystalloid use and
dangers of over use

(50% ESSENTIAL;
20% USEFUL; 30%
UNNECESSARY)



Use of tranexamic
acid (60%

ESSENTIAL; 20%
USEFUL; 20%
UNNECESSARY)



Comments

Prescribing pain medication with considerations for bleeding risk e.g. NSAIDS, aspirin, etc.

Essential

Useful

Unnecessary

Primary healthcare
setting (70%

ESSENTIAL; 20%
USEFUL; 10%
UNNECESSARY)



Comment

Avoid/treat infections promptly.

Essential

Useful

Unnecessary

Primary healthcare
setting (60%

ESSENTIAL; 20%
USEFUL; 20%
UNNECESSARY)



Tertiary healthcare
setting (70%

ESSENTIAL; 20%
USEFUL; 10%
UNNECESSARY)



Comment

Indications and contra-indications for intraoperative/ postoperative autologous blood collection and re-transfusion.

	Essential	Useful	Unnecessary
Primary healthcare setting (10% ESSENTIAL; 40% USEFUL; 50% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (60% ESSENTIAL; 30% USEFUL; 10% UNNECESSARY)	☐	☐	☐
Tertiary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐

Comment

Use of autologous blood donation.

	Essential	Useful	Unnecessary
Primary healthcare setting (10% ESSENTIAL; 20% USEFUL; 70% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (30% ESSENTIAL; 40% USEFUL; 30% UNNECESSARY)	☐	☐	☐
Tertiary healthcare setting (50% ESSENTIAL; 40% USEFUL; 10% UNNECESSARY)	☐	☐	☐

Comment

Cell salvage protocols.

	Essential	Useful	Unnecessary
Primary healthcare setting (10% ESSENTIAL; 20% USEFUL; 70% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (60% ESSENTIAL; 20% USEFUL; 20% UNNECESSARY)	☐	☐	☐
Comment			

Videos on cell salvage methodology.

	Essential	Useful	Unnecessary
Primary healthcare setting (10% ESSENTIAL; 30% USEFUL; 60% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (50% ESSENTIAL; 20% USEFUL; 30% UNNECESSARY)	☐	☐	☐
Tertiary healthcare setting (70% ESSENTIAL; 20% USEFUL; 10% UNNECESSARY)	☐	☐	☐
Comment			

Blood loss formula calculator for predicting blood loss.

	Essential	Useful	Unnecessary
Primary healthcare setting (20% ESSENTIAL; 50% USEFUL; 30% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (50% ESSENTIAL; 50% USEFUL)	☐	☐	☐
Tertiary healthcare setting (60% ESSENTIAL; 40% USEFUL)	☐	☐	☐

Comment

Early post-operative feeding versus upper GI haemorrhage prophylaxis.

	Essential	Useful	Unnecessary
Primary healthcare setting (20% ESSENTIAL; 40% USEFUL; 40% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐

Comment

Use of erythropoietin.

	Essential	Useful	Unnecessary
Primary healthcare setting (20% ESSENTIAL; 40% USEFUL; 40% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (60% ESSENTIAL; 30% USEFUL; 10% UNNECESSARY)	☐	☐	☐

Comment

Use of aprotinin.

	Essential	Useful	Unnecessary
Secondary healthcare setting (40% ESSENTIAL; 40% USEFUL; 20% UNNECESSARY)	☐	☐	☐
Tertiary healthcare setting (60% ESSENTIAL; 30% USEFUL; 10% UNNECESSARY)	☐	☐	☐
Comment			

Optimize cardiac output.

	Essential	Useful	Unnecessary
Primary healthcare setting (20% ESSENTIAL; 50% USEFUL; 30% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐
Tertiary healthcare setting (70% ESSENTIAL; 30%)	☐	☐	☐
Comment			

Optimize ventilation and oxygenation.

	Essential	Useful	Unnecessary
Primary healthcare setting (20% ESSENTIAL; 40% USEFUL; 40% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (60% ESSENTIAL; 40% USEFUL)	☐	☐	☐
Tertiary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐
Comment			

Optimize anaemia reserve.

	Essential	Useful	Unnecessary
Primary healthcare setting (30% ESSENTIAL; 40% USEFUL; 30% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (50% ESSENTIAL; 50% USEFUL)	☐	☐	☐
Tertiary healthcare setting (60% ESSENTIAL; 40% USEFUL)	☐	☐	☐

Comment

Maximize oxygen delivery.

	Essential	Useful	Unnecessary
Primary healthcare setting (50% ESSENTIAL; 20% USEFUL; 30% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐
Tertiary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐

Comment

Minimize oxygen consumption.

	Essential	Useful	Unnecessary
Primary healthcare setting (30% ESSENTIAL; 40% USEFUL; 30% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (70% ESSENTIAL; 20% USEFUL; 10% UNNECESSARY)	☐	☐	☐
Tertiary healthcare setting (60% ESSENTIAL; 30% USEFUL; 10% UNNECESSARY)	☐	☐	☐

Comment

4.6 Transfusion decision making tools

Transfusion decision making tools for **PRIMARY HEALTHCARE FACILITIES:**

	Essential	Useful	Unnecessary
Products, services and testing offered by the Blood Services (60% <i>ESSENTIAL</i> ; 30% <i>USEFUL</i> ; 10% <i>UNNECESSARY</i>)	☐	☐	☐
Comment 			
Transfusion risks and hazards (50% <i>ESSENTIAL</i> ; 40% <i>USEFUL</i> ; 10% <i>UNNECESSARY</i>)	☐	☐	☐
Comment 			
Cost of blood and blood products, including surcharges/levies (60% <i>ESSENTIAL</i> ; 30% <i>USEFUL</i> ; 10% <i>UNNECESSARY</i>)	☐	☐	☐
Comment 			
Restrictive transfusion thresholds (70% <i>ESSENTIAL</i> ; 20% <i>USEFUL</i> ; 10% <i>UNNECESSARY</i>)	☐	☐	☐
Comment 			
Single unit transfusion focus - transfuse and assess strategy (70% <i>ESSENTIAL</i> ; 20% <i>USEFUL</i> ; 10% <i>UNNECESSARY</i>)	☐	☐	☐
Comment 			

4.7 Tools to assist hospitals in setting up PBM programs

Guidelines for setting up healthcare setting appropriate PBM program (70% of the participants selected *ESSENTIAL*; 30% *USEFUL*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Self-audit guidelines and checklists (60% of the participants selected *ESSENTIAL*; 40% *USEFUL*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

PBM readiness checklists for hospitals to serve as a needs analysis (40% of the participants selected *ESSENTIAL*; 50% *USEFUL*; 10% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Setting metrics/targets – measures to see if set PBM targets are being met.

	Essential	Useful	Unnecessary
Primary healthcare setting (40% <i>ESSENTIAL</i> ; 50% <i>USEFUL</i> ; 10% <i>UNNECESSARY</i>)	☐	☐	☐
Secondary healthcare setting (70% <i>ESSENTIAL</i> ; 30% <i>USEFUL</i>)	☐	☐	☐
Tertiary healthcare setting (70% <i>ESSENTIAL</i> ; 30% <i>USEFUL</i>)	☐	☐	☐

Comment

Transfusion control measures – control measures for when patients should be transfused to ensure patients are transfused only when clinically necessary (60% of the participants selected *ESSENTIAL*; 20% *USEFUL*; 20% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

PBM checklists for patient history taking e.g. *Has the patient had a full blood count in the last six weeks, has the patient had an iron study, does the patient have the following symptoms, did the patient bleed intraoperatively? How much do you think the patient bleed? Postoperative bleeding?*

	Essential	Useful	Unnecessary
Primary healthcare setting (50% <i>ESSENTIAL</i> ; 30% <i>USEFUL</i> ; 20% <i>UNNECESSARY</i>)	☐	☐	☐
Secondary healthcare setting (60% <i>ESSENTIAL</i> ; 40% <i>USEFUL</i>)	☐	☐	☐
Tertiary healthcare setting (60% <i>ESSENTIAL</i> ; 40% <i>USEFUL</i>)	☐	☐	☐

Comment

Easy access templates for hospitals to write their PBM related protocols (60% *ESSENTIAL*; 30% *USEFUL*; 10% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Templates/checklists to identify bleeding risk.

	Essential	Useful	Unnecessary
Primary healthcare setting (50% ESSENTIAL; 30% USEFUL; 20% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐
Tertiary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐

Comment

Laboratory tools - List of tests to request for bleeding disorders.

	Essential	Useful	Unnecessary
Primary healthcare setting (40% ESSENTIAL; 40% USEFUL; 20% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐

Comment

Laboratory tools - List of tests for detection of anaemia and when to request what tests.

	Essential	Useful	Unnecessary
Primary healthcare setting (60% ESSENTIAL; 30% USEFUL; 10% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐
Tertiary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐

Comment

Laboratory awareness tools - What do elevated and/or decreased test results mean.

	Essential	Useful	Unnecessary
Primary healthcare setting (40% <i>ESSENTIAL</i> ; 60% <i>USEFUL</i>)	☐	☐	☐
Secondary healthcare setting (70% <i>ESSENTIAL</i> ; 30% <i>USEFUL</i>)	☐	☐	☐
Tertiary healthcare setting (60% <i>ESSENTIAL</i> ; 40% <i>USEFUL</i>)	☐	☐	☐

Comment

Guidance on how to set up pre-operative anaemia and bleeding clinic (40% *ESSENTIAL*; 30% *USEFUL*; 30% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Referenced literature providing evidence base for PBM implementation in South Africa, low and middle-income countries and global.

	Essential	Useful	Unnecessary
Primary healthcare setting (50% <i>ESSENTIAL</i> ; 30% <i>USEFUL</i> ; 20% <i>UNNECESSARY</i>)	☐	☐	☐
Secondary healthcare setting (70% <i>ESSENTIAL</i> ; 20% <i>USEFUL</i> ; 10% <i>UNNECESSARY</i>)	☐	☐	☐

Comment

How to set up hospital transfusion committee/blood user committee/PBM committee (40%

ESSENTIAL; 40% USEFUL; 20% UNNECESSARY)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Standing meeting agenda templates for hospital transfusion committee/blood user committee/PBM committee meetings.

	Essential	Useful	Unnecessary
Primary healthcare setting (30% <i>ESSENTIAL; 50% USEFUL; 20% UNNECESSARY)</i>	☐	☐	☐
Secondary healthcare setting (60% <i>ESSENTIAL; 40% USEFUL)</i>	☐	☐	☐
Tertiary healthcare setting (60% <i>ESSENTIAL; 40% USEFUL)</i>	☐	☐	☐

Comment

Committee representation guidelines for hospital transfusion committee/blood user committee/PBM committee.

	Essential	Useful	Unnecessary
Primary healthcare setting (30% <i>ESSENTIAL; 40% USEFUL; 30% UNNECESSARY)</i>	☐	☐	☐
Secondary healthcare setting (40% <i>ESSENTIAL; 60% USEFUL)</i>	☐	☐	☐
Tertiary healthcare setting (40% <i>ESSENTIAL; 60% USEFUL)</i>	☐	☐	☐

Comment

Standardized blood accountability forms (60% ESSENTIAL; 30% USEFUL; 10% UNNECESSARY)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Comprehensive informed consent documents for blood transfusion (60% ESSENTIAL; 30% USEFUL; 10% UNNECESSARY)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Code of conduct for ordering and administering transfusions.

	Essential	Useful	Unnecessary
Primary healthcare setting (40% ESSENTIAL; 50% USEFUL; 10% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (60% ESSENTIAL; 40% USEFUL)	☐	☐	☐
Tertiary healthcare setting (60% ESSENTIAL; 40% USEFUL)	☐	☐	☐

Comment

Audit tools (How to carry out an audit e.g. transfusion use, iron reactions, etc).

	Essential	Useful	Unnecessary
Primary healthcare setting (50% ESSENTIAL; 40% USEFUL; 10% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (60% ESSENTIAL; 40% USEFUL)	☐	☐	☐
Tertiary healthcare setting (60% ESSENTIAL; 40% USEFUL)	☐	☐	☐

Comment

Implementing electronic blood ordering systems.

	Essential	Useful	Unnecessary
Primary healthcare setting (10% ESSENTIAL; 70% USEFUL; 20% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (40% ESSENTIAL; 60% USEFUL)	☐	☐	☐
Tertiary healthcare setting (50% ESSENTIAL; 50% USEFUL)	☐	☐	☐

Comment

Guidance on how to implement policies/protocols/guidelines.

	Essential	Useful	Unnecessary
Primary healthcare setting (60% ESSENTIAL; 40% USEFUL)	☐	☐	☐
Secondary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐
Tertiary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐

Comment

4.8 Other tools.

Blood ordering form should include questions on whether alternate approaches other than transfusion have been considered for the patient.

	Essential	Useful	Unnecessary
Primary healthcare setting (40% ESSENTIAL; 50% USEFUL; 10% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (60% ESSENTIAL; 40% USEFUL)	☐	☐	☐
Tertiary healthcare setting (60% ESSENTIAL; 40% USEFUL)	☐	☐	☐

Comment

Blood usage/monitoring dashboard (one could login to a common portal and view blood usage of hospitals.

	Essential	Useful	Unnecessary
Primary healthcare setting (40% ESSENTIAL; 40% USEFUL; 20% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (50% ESSENTIAL; 40% USEFUL; 10% UNNECESSARY)	☐	☐	☐
Tertiary healthcare setting (50% ESSENTIAL; 40% USEFUL; 10% UNNECESSARY)	☐	☐	☐

Comment

Share PBM success stories (local and global).

	Essential	Useful	Unnecessary
Primary healthcare setting (50% ESSENTIAL; 30% USEFUL; 20% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (70% ESSENTIAL; 20% USEFUL; 10% UNNECESSARY)	☐	☐	☐
Tertiary healthcare setting (70% ESSENTIAL; 20% USEFUL; 10% UNNECESSARY)	☐	☐	☐

Comment

Questions and Answers platform e.g. PBM *WhatsApp* group.

	Essential	Useful	Unnecessary
Primary healthcare setting (40% ESSENTIAL; 50% USEFUL; 10% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (40% ESSENTIAL; 50% USEFUL; 10% UNNECESSARY)	☐	☐	☐
Tertiary healthcare setting (40% ESSENTIAL; 40% USEFUL; 20% UNNECESSARY)	☐	☐	☐

Comment

Information alerts giving updates on changes in clinical practices or changes in protocols/procedures (60% ESSENTIAL; 40% USEFUL for all three healthcare settings respectively).

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

5. How would you rate the importance of the following PBM modalities in PRIMARY, SECONDARY and TERTIARY healthcare facilities respectively in South Africa?

IV iron (50% ESSENTIAL; 40% USEFUL; 10% UNNECESSARY)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Erythropoietin

	Essential	Useful	Unnecessary
Primary healthcare setting (20% ESSENTIAL; 20% USEFUL; 60% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (50% ESSENTIAL; 50% USEFUL)	☐	☐	☐
Comment			

Intra-operative normovolaemic haemodilution.

	Essential	Useful	Unnecessary
Primary healthcare setting (20% ESSENTIAL; 20% USEFUL; 60% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (50% ESSENTIAL; 40% USEFUL; 10% UNNECESSARY)	☐	☐	☐
Tertiary healthcare setting (60% ESSENTIAL; 40% USEFUL)	☐	☐	☐
Comment			

Cell salvage equipment.

	Essential	Useful	Unnecessary
Primary healthcare setting (20% ESSENTIAL; 10% USEFUL; 70% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (60% ESSENTIAL; 40% USEFUL; 10% UNNECESSARY)	☐	☐	☐
Comment			

Optimizing anaemia before elective surgery (60% ESSENTIAL; 40% USEFUL)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Single unit transfusions (70% ESSENTIAL; 10% USEFUL; 20% UNNECESSARY)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Blood accountability forms.

	Essential	Useful	Unnecessary
Primary healthcare setting (60% ESSENTIAL; 20% USEFUL; 20% UNNECESSARY)	☐	☐	☐

Secondary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐

Comment

Motivation for blood transfusion.

	Essential	Useful	Unnecessary
Primary healthcare setting (50% ESSENTIAL; 30% USEFUL; 20% UNNECESSARY)	☐	☐	☐

Secondary healthcare setting (60% ESSENTIAL; 30% USEFUL; 10% UNNECESSARY)	☐	☐	☐

Tertiary healthcare setting (60% ESSENTIAL; 30% USEFUL; 10% UNNECESSARY)	☐	☐	☐

Comment

Point of care testing (POCT) Haematocrit.

	Essential	Useful	Unnecessary
Primary healthcare setting (20% ESSENTIAL; 40% USEFUL; 40% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (40% ESSENTIAL; 20% USEFUL; 40% UNNECESSARY)	☐	☐	☐
Tertiary healthcare setting (40% ESSENTIAL; 20% USEFUL; 40% UNNECESSARY)	☐	☐	☐

Comment

POCT INR

	Essential	Useful	Unnecessary
Primary healthcare setting (30% ESSENTIAL; 60% USEFUL; 10% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐
Tertiary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐

Comment

POCT Platelet Function

	Essential	Useful	Unnecessary
Primary healthcare setting (20% ESSENTIAL; 30% USEFUL; 50% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (50% ESSENTIAL; 40% USEFUL; 10% UNNECESSARY)	☐	☐	☐
Tertiary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐

Comment

POCT intra-operative coagulation monitoring (e.g. ROTEM or TEG)

	Essential	Useful	Unnecessary
Secondary healthcare setting (50% ESSENTIAL; 40% USEFUL; 10% UNNECESSARY)	☐	☐	☐
Tertiary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐

Comment

6. Toolkit look & feel: Please rate the following options in terms of how the toolkit should be made available for practical access and use.

	Essential	Useful	Unnecessary
All-inclusive package including videos, diagrams, lectures/podcasts, policies, procedures, templates, etc. (30% ESSENTIAL; 70% USEFUL)	☐	☐	☐
Physical/Paper based toolkit with all of the above (20% ESSENTIAL; 70% USEFUL; 10% UNNECESSARY)	☐	☐	☐
Should be a combination of Digital and Physical (60% ESSENTIAL; 30% USEFUL; 10% UNNECESSARY)	☐	☐	☐
Should be in a poster format (30% ESSENTIAL; 60% USEFUL; 10% UNNECESSARY)	☐	☐	☐
There should be separate toolkits for public and private sector hospitals (20% ESSENTIAL; 20% USEFUL; 60% UNNECESSARY)	☐	☐	☐
There should be a PBM toolkit specific for nurses (50% ESSENTIAL; 40% USEFUL; 10% UNNECESSARY)	☐	☐	☐
Comments			

Delphi Survey Round 2: Developing a validated framework for a Patient Blood Management (PBM) toolkit appropriate for the South African healthcare context.

PBM education deficiencies and education failures that need to be addressed.

SECTION D: PBM education deficiencies and education failures.

This section deals with the PBM knowledge deficiencies that need **to be addressed amongst the various stakeholder groups, including existing education failures.**

7.1 PBM education deficiencies that need to be addressed.

a. Clinical and ethical aspects of PBM

Please rate the importance of addressing the following PBM knowledge deficiencies amongst **NURSES**:

	Essential	Useful	Unnecessary
Knowledge of haemostasis (60% <i>ESSENTIAL</i> ; 40% <i>USEFUL</i>)	☐	☐	☐
Role of the laboratory in PBM (60% <i>ESSENTIAL</i> ; 40% <i>USEFUL</i>)	☐	☐	☐
When to order what laboratory tests (70% <i>ESSENTIAL</i> ; 30% <i>USEFUL</i>)	☐	☐	☐
Understanding laboratory test results (70% <i>ESSENTIAL</i> ; 30% <i>USEFUL</i>)	☐	☐	☐
Medications that cause anaemia (60% <i>ESSENTIAL</i> ; 40% <i>USEFUL</i>)	☐	☐	☐
Knowledge of blood and blood products and their indications (60% <i>ESSENTIAL</i> ; 40% <i>USEFUL</i>)	☐	☐	☐
Blood ordering - when to order what products (50% <i>ESSENTIAL</i> ; 50% <i>USEFUL</i>)	☐	☐	☐
Blood transfusion is not the first choice treatment for anaemia (70% <i>ESSENTIAL</i> ; 30% <i>USEFUL</i>)	☐	☐	☐
Cost of blood and blood products (50% <i>ESSENTIAL</i> ; 50% <i>USEFUL</i>)	☐	☐	☐
Ethical aspects of the use of blood and blood products (60%	☐	☐	☐

ESSENTIAL; 40%
USEFUL)

Process for informed
consent (70%
ESSENTIAL; 30%
USEFUL)

☐☐☐

Medico-legal
implications of
inappropriate blood
transfusions (50%
ESSENTIAL; 50%
USEFUL)

☐☐☐

Medico-legal
implications of
inappropriate
anaemia
management (60%
ESSENTIAL; 40%
USEFUL)

☐☐☐

HIV related anaemia
management (70%
ESSENTIAL; 30%
USEFUL)

☐☐☐

Comment

Cost of testing (various crossmatch types) including out of hours levies/surcharges.

Essential

Useful

Unnecessary

Doctors (50%
ESSENTIAL; 50%
USEFUL)

☐☐☐

Nurses (30%
ESSENTIAL; 70%
USEFUL)

☐☐☐

Comment

Blood wastage - Blood Service and Health Service implications.

Essential

Useful

Unnecessary

Doctors (60%
ESSENTIAL; 40%
USEFUL)

☐☐☐

Nurses (50%
ESSENTIAL; 50%
USEFUL)

☐☐☐

Comment

Ordering blood on a returnable basis (BRB) benefits (60% *ESSENTIAL*; 40% *USEFUL* for doctors and nurses respectively)

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Appropriate storage of blood and blood products (70% *ESSENTIAL*; 30% *USEFUL*)

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐

Comment

Difference between PBM and Blood Conservation. (60% of the participants selected *ESSENTIAL*; 40% selected *USEFUL* for both doctors and nurses)

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Making time for patient education and empowerment (70% selected *ESSENTIAL*; 30% *USEFUL*)

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐

Comment

Ethical imperative for PBM (70% selected *ESSENTIAL*; 30% *USEFUL* for doctors and nurses respectively)

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐

Comment

Clinically appropriate transfusion decision making (Moving away from knee jerk reactions to a more informed approach) (70% selected *ESSENTIAL*; 30% *USEFUL*)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Restrictive transfusion thresholds (70% selected *ESSENTIAL*; 30% *USEFUL*)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Adequate assessment of patients – Taking proper history is important for PBM (60% selected *ESSENTIAL*; 40% *USEFUL*)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Early patient referrals (70% selected *ESSENTIAL*; 20% *USEFUL*; 10% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Addressing PBM education deficiencies

b. Blood conservation

Alternate approaches to anaemia management other than transfusion (70% selected *ESSENTIAL*; 30% *USEFUL*)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Autologous transfusion options (10% selected *ESSENTIAL*; 70% *USEFUL*; 20% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Cell salvage

	Essential	Useful	Unnecessary
Doctors (60% <i>ESSENTIAL</i> ; 40%)	☐	☐	☐

Nurses (30%
ESSENTIAL; 50%
USEFUL; 20%
UNNECESSARY)

☐☐☐

Comment

Addressing PBM education deficiencies
c. Surgical aspects

Pre-operative, intra-operative and post-operative patient care (70% selected *ESSENTIAL*; 30% *USEFUL*)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Timing of surgery - When to delay surgery (30% selected *ESSENTIAL*; 50% *USEFUL*; 20% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Use of tranaxemic acid and other antifibrinolytics (50% selected *ESSENTIAL*; 50% *USEFUL*)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Addressing PBM education deficiencies
d. Oral iron and IV iron

Oral iron and IV iron - When to administer what (60% selected *ESSENTIAL*; 40% *USEFUL*)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Iron metabolism - role of hepcidin in iron absorption.

	Essential	Useful	Unnecessary
Doctors (70% <i>ESSENTIAL</i> ; 30% <i>USEFUL</i>)	☐	☐	☐

Nurses (20%
selected
ESSENTIAL; 70%
USEFUL; 10%
UNNECESSARY)

☐☐☐

Comment

IV iron - Dosage and administration (60% selected *ESSENTIAL*; 40% *USEFUL*)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

IV iron - Preventing and managing adverse events (60% selected *ESSENTIAL*; 40% *USEFUL*)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Addressing PBM education deficiencies.

e. Preventing iatrogenic blood loss

Taking smaller volume samples for laboratory testing (micro-sampling/micro-bleeding).

	Essential	Useful	Unnecessary
Doctors (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐

Nurses (60%
ESSENTIAL; 40%
USEFUL)

☐☐☐

Comment

Avoiding unnecessary repeat testing (40% selected ESSENTIAL; 60% USEFUL)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Benefits of Point-of-care testing (POCT) (40% selected ESSENTIAL; 60% USEFUL)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

TEG and ROTEM use and interpretation.

	Essential	Useful	Unnecessary
Doctors (60% selected; 40% USEFUL)	☐	☐	☐

Nurses (20%
selected
ESSENTIAL; 60%
USEFUL; 20%
UNNECESSARY)

☐☐☐

Comment

Addressing PBM education deficiencies
f. Bleeding and blood loss.

Identifying high risk patients (50% selected *ESSENTIAL*; 50% *USEFUL*)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Medications, herbs and supplements that increase bleeding risk.

	Essential	Useful	Unnecessary
Doctors (70% <i>ESSENTIAL</i> ; 30% <i>USEFUL</i>)	☐	☐	☐

Nurses (60% selected; 40% <i>USEFUL</i>)	☐	☐	☐

Comment

Managing bleeding risk (50% selected *ESSENTIAL*; 50% *USEFUL*)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Managing patients on anticoagulant/anti-platelet therapy. (30% selected *ESSENTIAL*; 70% *USEFUL*)

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐

Comment

Effects of drug interactions (30% selected *ESSENTIAL*; 70% *USEFUL*)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

7.2 Please rate the importance of addressing the following PBM awareness aspects amongst management and administrative stakeholders such as hospital management, medical aids, and finance related stakeholders (60% selected *ESSENTIAL*; 40% *USEFUL*)

	Essential	Useful	Unnecessary
Management and healthcare leadership roles in creating improved health culture.	☐	☐	☐
Comment			

Delphi Survey Round 2: Developing a validated framework for a Patient Blood Management (PBM) toolkit appropriate for the South African healthcare context.

Patient education and empowerment

8. EDUCATION NEEDS FOR PATIENT EMPOWERMENT.

8.1 Please rate the importance of addressing the following PBM awareness needs amongst patients.

	Essential	Useful	Unnecessary
Causes of anaemia (60% <i>ESSENTIAL</i> ; 40% <i>USEFUL</i>)	☐	☐	☐
Comment			

Consequences of anaemia (70% *ESSENTIAL*; 30% *USEFUL*)

☐
☐
☐

Comment

Iron deficiency anaemia (70% *ESSENTIAL*; 30% *USEFUL*)

☐
☐
☐

Comment

Basics of blood testing and blood results (40% *ESSENTIAL*; 40% *USEFUL*)

☐
☐
☐

USEFUL; 20%
UNNECESSARY)

Comment

General health
awareness and
taking ownership of
health (60%
ESSENTIAL; 40%
USEFUL)

☐☐☐

Comment

Importance of
seeking medical
guidance from the
right people (60%
ESSENTIAL; 30%
USEFUL; 10%
UNNECESSARY)

☐☐☐

Comment

Change mindset of
patients "Doctor
always knows best"
philosophy (60%
ESSENTIAL; 30%
USEFUL; 10%
UNNECESSARY)

☐☐☐

Comment

Options for patients
who refuse blood
transfusions (70%
ESSENTIAL; 30%
USEFUL)

☐☐☐

Comment

8.2 Approaches to educating and empowering patients.

8.2.1. Please rate the value of the following approaches to aid in creating better awareness of anaemia amongst patients.

Essential

Useful

Unnecessary

Information
campaigns by
healthcare
workers/healthcare
organizations (50%
ESSENTIAL; 50%

☐☐☐

USEFUL)

Comment

Use of radio power

(30% *ESSENTIAL*;
60% *USEFUL*; 10%
UNNECESSARY)

☐☐☐

Comment

Use of social media

(70% *ESSENTIAL*;
30% *USEFUL*)

☐☐☐

Comment

Make available

language
appropriate
information booklets
for patients (60%
ESSENTIAL; 40%
USEFUL)

☐☐☐

Comment

Patient education

and empowerment
talks (50%
ESSENTIAL; 50%
USEFUL)

☐☐☐

Comment

Asking doctors
questions about
treatment options

(70% *ESSENTIAL*;
20% *USEFUL*; 10%
UNNECESSARY)

☐☐☐

Comment

Medical aids serving
as a voice to educate
patients (70%

ESSENTIAL; 20%
USEFUL; 10%
UNNECESSARY)

☐☐☐

Comment

Patients empowering

patients with
information (60%
ESSENTIAL; 10%
USEFUL; 30%
UNNECESSARY)

☐☐☐

Comment

Digital education
app. for patients
(50% *ESSENTIAL*;
40% *USEFUL*; 10%
UNNECESSARY)

☐☐☐

Comment

Videos and posters
in waiting rooms
(primary, secondary
and tertiary
healthcare facilities)
(70% *ESSENTIAL*;
20% *USEFUL*; 10%
UNNECESSARY)

☐☐☐

Comment

Community
healthcare workers
providing education
in the respective
communities (70%
ESSENTIAL; 30%
USEFUL)

☐☐☐

Comment

Sharing of patient
stories (eventful and
uneventful) (50%
ESSENTIAL; 40%
USEFUL; 10%
UNNECESSARY)

☐☐☐

Comment

Online education
e.g. YouTube type
videos (50%
ESSENTIAL; 50%
USEFUL)

☐☐☐

Comment

9. Please rate the importance of addressing the following education failures that impact PBM implementation in hospitals in South Africa.

Lack of support from hospital management (70% *ESSENTIAL*; 30% *USEFUL*)

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Linear type medical education culture where education is mainly knowledge or theoretically focused rather than being practical or application focused (60% *ESSENTIAL*; 40% *USEFUL*)

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Lack of PBM education in undergraduate medical education for nurses (70% *ESSENTIAL*; 30% *USEFUL*)

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Lack of education on good clinical transfusion practices in undergraduate medical education (70% *ESSENTIAL*; 30% *USEFUL*)

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Lack of online self-learning PBM learning programs for South Africa (60% *ESSENTIAL*; 40% *USEFUL*)

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Lack of training on how to utilize healthcare resources optimally i.e. practicing in resource constraint settings (60% *ESSENTIAL*; 40% *USEFUL*)

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Interns not attending scheduled PBM related training sessions (70% *ESSENTIAL*; 30% *USEFUL*)

☐ Essential

☐ Useful

☐ Unnecessary

Comment

PBM training to empower nurses is lacking yet they are the 'ears and eyes of doctors.' (60% *ESSENTIAL*; 40% *USEFUL*)

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Philosophical education approaches - therefore not translated in practice (50% *ESSENTIAL*; 30% *USEFUL*; 10% *UNNECESSARY*)

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Doctors should be taught by doctors, surgeons should be taught by surgeons, nurses be taught by nurses (20% *ESSENTIAL*; 70% *USEFUL*; 10% *UNNECESSARY*)

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Delphi Survey Round 2: Developing a validated framework for a Patient Blood Management (PBM) toolkit appropriate for the South African healthcare context.

Addressing challenges and barriers to PBM implementation in South Africa.

SECTION E: Challenges and barriers to PBM implementation in South Africa and how a PBM toolkit may help with implementation.

This section deals with the need to address existing challenges and barriers that will help to enable PBM implementation in hospitals in South Africa.

10. Please rate the importance of addressing the following barriers and challenges to PBM implementation in South Africa.

Addressing barriers and challenges to PBM implementation

10.1 Awareness, education and buy-in.

PBM is perceived as overwhelming - it is more work for doctors (30% of the participants selected ESSENTIAL; 70% selected USEFUL)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Awareness talks and initiatives attract the same individuals who are usually already on board with PBM. Awareness reach is not wide enough to target and get others on board (50% of the participants selected ESSENTIAL; 50% selected USEFUL)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of PBM awareness amongst General Practitioners; yet GP environment is ideal for early diagnosis and correction of anaemia (70% of the participants selected ESSENTIAL; 30% selected USEFUL)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Nurses are often excluded from PBM awareness initiatives yet they have a key role to play in PBM (70% of the participants selected ESSENTIAL; 30% selected USEFUL)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Community health workers are not educated on PBM; they are ideal partners to educate communities using language and level appropriate for various communities (70% of the participants selected ESSENTIAL; 30% selected USEFUL)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of PBM guidance and support for doctors at all levels in hospitals (50% of the participants selected ESSENTIAL; 50% selected USEFUL)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Limited access to advisory support from Haematologists in the private and public sector (50% of the participants selected *ESSENTIAL*; 40% selected *USEFUL*; 10% selected *UNNECESSARY*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of buy-in and support from senior leadership in hierarchical structures within hospitals (70% of the participants selected *ESSENTIAL*; 30% selected *USEFUL*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Some specialties not on board with PBM. If you agree, please comment which... (40% of the participants selected *ESSENTIAL*; 50% selected *USEFUL*; 10% *UNNECESSARY*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation
10.2. Culture of practice amongst doctors.

Ego of doctors - making transfusion practice changes difficult (70% of the participants selected *ESSENTIAL*; 20% selected *USEFUL*; 10% *UNNECESSARY*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Doctors chase numbers when it comes to patients' haemoglobin levels (70% of the participants selected *ESSENTIAL*; 20% selected *USEFUL*; 10% *UNNECESSARY*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Focus is still on 'product' rather than 'patient.' (50% of the participants selected *ESSENTIAL*; 50% selected *USEFUL*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Transfusion triggers vary amongst clinicians within the same discipline. *(60% of the participants selected ESSENTIAL; 40% selected USEFUL)*

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Single unit transfusions (transfuse and assess strategy) in non-bleeding patients is not a culture of practice in most settings. *(60% of the participants selected ESSENTIAL; 40% selected USEFUL)*

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of surgical capability in district hospitals – Patients have to be referred causing delay in treatment. *(70% of the participants selected ESSENTIAL; 30% selected USEFUL)*

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Understanding of response time required for oral and IV iron to work. *(50% of the participants selected ESSENTIAL; 50% selected USEFUL)*

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of accountability. *(60% of the participants selected ESSENTIAL; 40% selected USEFUL)*

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.3 Finance related challenges.

Inadequate budget for laboratory screening tests. Anaemia goes undetected in certain patients at primary healthcare facilities and district hospitals preventing early treatment. *(50% of the participants selected ESSENTIAL; 50% selected USEFUL)*

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Gatekeeping challenges placing restrictions on ordering of blood tests. (40% of the participants selected *ESSENTIAL*; 60% selected *USEFUL*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Insufficient funds to purchase Point of care testing devices (60% of the participants selected *ESSENTIAL*; 40% selected *USEFUL*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

TEG - expensive to run tests. (30% of the participants selected *ESSENTIAL*; 60% selected *USEFUL*; 10% *UNNECESSARY*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Not enough budget to employ more hospital staff. Current staff are already overworked with little motivation to do more than they are already doing. (60% of the participants selected *ESSENTIAL*; 20% selected *USEFUL*; 20% *UNNECESSARY*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation 10.4 Capacity - Manpower challenges.

No transfusion practitioners in hospitals. (50% of the participants selected *ESSENTIAL*; 20% selected *USEFUL*; 30% *UNNECESSARY*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

No dedicated PBM nurses in hospitals (70% of the participants selected *ESSENTIAL*; 10% selected *USEFUL*; 20% *UNNECESSARY*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

No transfusion medicine specialists in hospitals in South Africa. (50% of the participants selected *ESSENTIAL*; 20% selected *USEFUL*; 30% *UNNECESSARY*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Not enough staff to run pre-operative anaemia clinics. (50% of the participants selected *ESSENTIAL*; 40% selected *USEFUL*; 10% *UNNECESSARY*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

No time to review blood accountability forms and monitor blood usage. (50% of the participants selected *ESSENTIAL*; 30% selected *USEFUL*; 20% *UNNECESSARY*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Backlog of surgical cases - Cannot delay surgery to optimize anaemia in patients. (60% of the participants selected *ESSENTIAL*; 40% selected *USEFUL*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Doctors spending time on administrative tasks due to lack of administrative support in public healthcare sector. (40% of the participants selected *ESSENTIAL*; 60% selected)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation
10.5 Anaemia burden.

Oral iron, and not blood transfusion should be the first modality for correcting iron deficiency - This is not a common culture of practice especially in hospitalized patients. (60% of the participants selected *ESSENTIAL*; 40% selected *USEFUL*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Oral iron is not always well tolerated by some patients - more tolerable iron preparations come at a higher cost. *(50% of the participants selected ESSENTIAL; 20% selected USEFUL)*

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Patients are not educated on how to take oral iron. *(70% of the participants selected ESSENTIAL; 30% selected USEFUL)*

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Oversampling of patients/unnecessary repeat blood tests contribute to anaemia in hospitalized patients. *(60% of the participants selected ESSENTIAL; 40% USEFUL)*

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Use of smallest size blood collection tube practical for laboratory analysis is not a culture of practice. *(60% of the participants selected ESSENTIAL; 40% USEFUL)*

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Small size tubes are not always available for use in adult wards. *(70% of the participants selected ESSENTIAL; 30% USEFUL)*

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of patient-centered healthcare culture. *(70% of the participants selected ESSENTIAL; 20% USEFUL; 10% UNNECESSARY)*

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Patients not empowered and educated with regards to iron deficiency and the associated consequences. (70% of the participants selected *ESSENTIAL*; 30% *USEFUL*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Delphi Survey Round 2: Developing a validated framework for a Patient Blood Management (PBM) toolkit appropriate for the South African healthcare context.

Addressing challenges and barriers to PBM implementation in South Africa.

Addressing barriers and challenges to PBM implementation
10.6 Logistical challenges.

Patients not referred early enough to allow for anaemia workup and treatment. (70% of the participants selected *ESSENTIAL*; 30% *USEFUL*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

No onsite Pathology laboratory in some public hospitals causing delays in laboratory testing. (50% of the participants selected *ESSENTIAL*; 30% *USEFUL*; 20% *UNNECESSARY*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Delays in receiving laboratory test results in the public sector. (40% of the participants selected *ESSENTIAL*; 50% *USEFUL*; 10% *UNNECESSARY*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Patients go home before tests results are received, and with no treatment. (60% of the participants selected *ESSENTIAL*; 40% *USEFUL*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Patients travel long distances to tertiary care facilities. (70% of the participants selected *ESSENTIAL*; 30% *USEFUL*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Not enough hospital beds to admit patients while awaiting test results for proper diagnosis and treatment. (50% of the participants selected *ESSENTIAL*; 40% *USEFUL*; 10% *UNNECESSARY*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Patients return to healthcare facilities in worse off conditions. (50% of the participants selected *ESSENTIAL*; 40% *USEFUL*; 10% *UNNECESSARY*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Some patients never return for treatment / follow up. (60% of the participants selected *ESSENTIAL*; 40% *USEFUL*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Hospitals not having onsite blood banks - more blood is ordered as a safety measure to prevent transfusion delays. (50% of the participants selected *ESSENTIAL*; 50% *USEFUL*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation 10.7 Policy challenges.

Not enough policies to guide practices e.g. anaemia, PBM, transfusion. (Please specify where necessary). (40% of the participants selected *ESSENTIAL*; 60% *USEFUL*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Absence of transfusion focus in the National Core Standards for Health Establishments in South Africa. *(60% of the participants selected ESSENTIAL; 40% USEFUL)*

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of guidelines on creating, changing and reviewing policies. *(50% of the participants selected ESSENTIAL; 50% USEFUL)*

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Fragmented policies - no standard blood transfusion policy in hospitals. *(70% of the participants selected ESSENTIAL; 30% USEFUL)*

☐ Essential ☐ Useful ☐ Unnecessary

Comment

No specific guidance on PBM in Essential Medicine List guidelines. *(70% of the participants selected ESSENTIAL; 30% USEFUL)*

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lengthy guidelines - Simple stronger policies are needed. *(60% of the participants selected ESSENTIAL; 40% USEFUL)*

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of multidisciplinary collaboration in policy development. *(50% of the participants selected ESSENTIAL; 50% USEFUL)*

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Challenges getting timeous endorsement of policies by department of health at national level.

(60% of the participants selected ESSENTIAL; 40% USEFUL)

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Challenges getting timeous endorsement of policies by department of health at provincial level. *(60% of the participants selected ESSENTIAL; 40% USEFUL)*

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.8 Infrastructure challenges.

Lack of space and infrastructure to set up anaemia clinics. *(40% of the participants selected ESSENTIAL; 50% USEFUL; 10% UNNECESSARY)*

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Absence of and/or dysfunctional computer systems and IT support for access to laboratory results is poor. *(50% of the participants selected ESSENTIAL; 40% USEFUL; 10% UNNECESSARY)*

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Absence of electronic blood ordering systems which can create alerts/warnings preventing unnecessary blood ordering. *(50% of the participants selected ESSENTIAL; 40% USEFUL; 10% UNNECESSARY)*

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Computer systems between hospitals and blood banks are not linked. *(50% of the participants selected ESSENTIAL; 40% USEFUL; 10% UNNECESSARY)*

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.9. Lack of general PBM resources/modalities in hospitals.

Hematinics in primary healthcare facilities not always available. (40% of the participants selected *ESSENTIAL*; 50% selected *USEFUL*; 10% *UNNECESSARY*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Blood warmers not available in most hospitals. (40% of the participants selected *ESSENTIAL*; 40% selected *USEFUL*; 20% *UNNECESSARY*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of cell salvage equipment. (30% of the participants selected *ESSENTIAL*; 60% selected *USEFUL*; 10% *UNNECESSARY*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Consumables for cell salvage devices not available. (30% of the participants selected *ESSENTIAL*; 60% selected *USEFUL*; 10% *UNNECESSARY*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Oral iron not readily available. (60% of the participants selected *ESSENTIAL*; 30% selected *USEFUL*; 10% *UNNECESSARY*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

IV Iron not readily available. (70% of the participants selected *ESSENTIAL*; 30% selected *USEFUL*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of comfort with IV iron use. (60% of the participants selected *ESSENTIAL*; 40% selected *USEFUL*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of validated devices for point of care testing e.g. POCT heamoglobin, haematocrit, INR).

(30% of the participants selected ESSENTIAL; 60% selected USEFUL; 10% UNNECESSARY)

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Point-of-care coagulation testing not available in theatres. *(30% of the participants selected*

ESSENTIAL; 70% selected USEFUL)

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Tranexamic acid not available in some hospitals. *(40% of the participants selected ESSENTIAL; 30%*

selected USEFUL; 20% UNNECESSARY)

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Erythropoietin not available in some facilities. *(30% of the participants selected ESSENTIAL; 60%*

selected USEFUL; 10% UNNECESSARY)

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.10. General challenges.

Lack of hospital monitoring systems for blood usage - Dependence on Blood Services for blood usage data. *(50% of the participants selected ESSENTIAL; 50% selected USEFUL)*

☐

Essential

☐

Useful

☐

Unnecessary

Comment

No accountability measures for irrational use of blood and blood products including blood wastage. *(70% of the participants selected ESSENTIAL; 30% selected USEFUL)*

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Lack of proper informed consent process for transfusion. (60% of the participants selected ESSENTIAL; 40% selected USEFUL)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Blood user committees either non-existent or not adequately functional. (70% of the participants selected ESSENTIAL; 30% selected USEFUL)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Time challenges and/or poor commitment from members of blood users committee/hospital transfusion committee. (70% of the participants selected ESSENTIAL; 30% selected USEFUL)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Blood requisition form does include questions on whether treatment options other than transfusion have been considered for the patient. (30% of the participants selected ESSENTIAL; 60% selected USEFUL; 10% UNNECESSARY)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Blood requisition form does not ask for reasons why blood is being ordered for the patient. (60% of the participants selected ESSENTIAL; 20% selected USEFUL; 20% UNNECESSARY)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

General comments and suggestions

Thank you very much for completing Round 1 of the Delphi survey. I will provide feedback on this round of the survey once all participant responses are submitted and analyzed. I will also communicate the details for Round 3 of the survey. Round 3 (last round) of the Delphi survey will be much shorter. I sincerely appreciate your time and contribution to this study.

Appendix F3

FEEDBACK ON DELPHI SURVEY ROUND TWO

Developing a validated framework for a Patient Blood Management (PBM) toolkit appropriate for the South African healthcare context

Dear Doctor/Professor

Thank you once again for your participation in the Delphi process and for your contribution given during Round Two of the survey.

According to Larson and Wissman consensus is reached where 80% of the participants indicate a similar value (to a specific item) as their choice. After Round Two consensus was reached on an additional 183 statements giving an overall 72.5% consensus.

Statements on which consensus was reached have been removed from Round Three, and only the remaining statements have been included for your consideration.

In the feedback provided, you will note that all the statements on which consensus had been reached are presented/shaded in GREEN, and comments from participants are included.

Where required, I have made comments in response to questions asked/comments made by the participants.

These are indicated next to the participant's comment as **"Response VR"** in bold. Thanks to the degree of consensus reached, Round Three will be much shorter.

Kind regards

Vanitha Rambiritch

Welcome and introduction

Thank you for taking the time to participate in Round 2 of the Delphi survey.

By proceeding with the survey, it is accepted that you give informed consent to participate in this study. Your time, input and contribution is very much appreciated.

STUDY AIM: To develop a validated framework for a South African healthcare needs focused Patient Blood Management (PBM) toolkit encompassing the essential, cost effective, feasible, evidence based PBM guidance measures to serve as a template to inform the development of a clinical practice PBM toolkit for optimizing the care of patients and avoiding the inappropriate use of blood transfusions.

In professional education, a **‘toolkit’ is defined as a resource that helps a professional improve his or her competence, knowledge or skills.** For the purpose of this study, a PBM toolkit will comprise a host of guidance resources serving as tools to aid clinicians in diagnosing and treating anaemia, and managing bleeding and blood loss in patients. Tools for a PBM toolkit may be in the form of guidelines, standard operating procedures, diagrams, educational material, recorded lectures, posters, videos, case scenarios, information alerts, etc.

Please fill in your details below

Name

You have been selected to participate in this study based on your PBM knowledge and expertise and your active involvement in leading and guiding PBM implementation. Your opinion as a participant is sought on the relative importance of each criterion listed in the survey. Each statement must be evaluated in respect of its importance as an aspect or criterion that must be included in a framework to guide the development of a PBM toolkit appropriate for the South African healthcare environment.

This survey comprises five sections. You are required to rate each statement in every section as either:

Essential: (This criterion must **DEFINITELY BE INCLUDED** in the framework for a PBM toolkit)

Useful: This criterion **CAN BE INCLUDED** in the framework for a PBM toolkit)

Unnecessary: This criterion must **BE EXCLUDED** from the framework for a PBM toolkit)

This second round of the Delphi survey will require 30 - 60 minutes of your time. Thank you for your time and contribution.

SECTION A: The importance of PBM implementation in South Africa and the need for a PBM toolkit.
This section deals with the reasons why PBM implementation is important in South Africa and why a PBM toolkit is needed.

1. How would you rate the following reasons for why PBM implementation is important in South Africa

It supports a preventative healthcare paradigm.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

It is a means to avoid and reduce transfusion adverse effects.

☐ Essential ☐ Useful ☐ Unnecessary

Comment: *"Classic" transfusion adverse effects are relatively rare, even when accounting for poor reporting. Emphasizing adverse events, especially when it is perceived to be rare, have little impact on changing clinical practice.*

It encourages research driven improved clinical practices.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

It offers financial benefits to patients and the healthcare system.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Implementation of PBM Pillar One is a good enough start for South Africa.

☐ Essential ☐ Useful ☐ Unnecessary

Comment: *All pillars should be strived for.*

2. How would you rate the following reasons why a PBM tool kit is needed in hospitals in South Africa?

A toolkit will help to jumpstart PBM implementation in South Africa.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

It will serve as an educational platform for continuous medical education.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

It will serve as a quality improvement approach to patient care and overall healthcare

☐ Essential ☐ Useful ☐ Unnecessary

Comment

It will encourage accountability in clinical decision-making.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

SECTION B: Audit and Monitoring of blood usage in hospitals.

This section deals with the need to audit and monitor blood usage in hospitals and how best this should be done.

3.1. Who should monitor the usage of blood products?

	Essential	Useful	Unnecessary
Blood Services.	☐	☐	☐
Hospital management.	☐	☐	☐
Transfusion practitioner appointed for the hospital.	☐	☐	☐
Hospital appointed transfusion/ PBM nurse.	☐	☐	☐
Heads of each department.	☐	☐	☐
Department of Health.	☐	☐	☐

Comments:

- *Monitoring should be done by those who or at a level where there is direct influence over clinical practice.*
- *If the hospital had resources to employ transfusion practitioners or PBM nurses then they would need to monitor usage, although I don't think these appointments are realistic.*

PBM tools appropriate for Primary, Secondary and Tertiary level healthcare facilities.

SECTION C: Guidance resources needed as tools for a PBM toolkit appropriate for primary, secondary and tertiary level hospitals/healthcare facilities respectively in South Africa.

This section deals with selecting the essential, cost-effective, feasible, best practice, evidence based measures and resources as clinical practice tools for a PBM toolkit appropriate for Primary, Secondary and Tertiary level hospitals/healthcare facilities in South Africa.

Please rate the importance of the following as tools for a PBM toolkit appropriate for PRIMARY, SECONDARY and TERTIARY LEVEL hospitals/healthcare facilities respectively.

Tools for a PBM toolkit may be in the form of guidelines, standard operating procedures, diagrams, educational material, recorded lectures, posters, videos, case scenarios, information alerts, etc.)

4.1 ANAEMIA FOCUS TOOLS.

4.1.a. Tools for detection and management of anaemia.

Anaemia detection algorithms/flowcharts

	Essential	Useful	Unnecessary
Tertiary healthcare setting	☐	☐	☐

Comment

List of drugs that cause anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment: My experience is that only pharmacists and haematologists "know" which drugs cause anaemia - hence my recommendation that such a list be available at all levels.

When to refer patients for further evaluation.

	Essential	Useful	Unnecessary
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

4.1.b. Iron deficiency anaemia diagnosis and treatment tools - Advice on the following:

Prescribing oral iron: How and when it should be taken.

	Essential	Useful	Unnecessary
Tertiary healthcare setting	☐	☐	☐

Comment

4.1.c IV Iron Tools

Please rate the following tools for a PBM toolkit

IV Iron tools for PRIMARY HEALTHCARE FACILITIES:

	Essential	Useful	Unnecessary
Demystify IV iron use – Provide scientific basis that argue the myths	☐	☐	☐
Indications for IV iron	☐	☐	☐
IV iron: Administration, timing and dosage	☐	☐	☐
Preventing and managing adverse events	☐	☐	☐

Comments

- *My responses are premised on the assumption that "we" are recommending IV iron be prescribed and administered at primary healthcare level.*
- *I still feel that information for primary facilities should focus on the management that they can offer at their clinics. It would be useful to know that IV iron is an option for patients and when to refer people for this service, but the actual administration information would not be relevant.*

Digital forms to simplify the motivation for IV iron to funders.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

4.1.d. HIV related anaemia tools.

Risk factors associated with anaemia in HIV infection (history of clinical AIDS, CD 4 cell count, viral load, women, Zidovudine use, etc.)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

The major causes of HIV related anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Drugs that commonly cause myelosuppression in HIV infected patients.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Manage anaemia of inflammatory disease as a cause of HIV related anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Malignancies that can lead to anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment: *Knowing how much of our blood likely goes to persons living with HIV makes this essential to me.*

Interpretation of iron studies in HIV patients.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Use of recombinant erythropoietin such as erythropoietin alfa.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐

Comments:

- *My answers on the premise that EPO is only available in the tertiary setting.*
- *I question the realistic availability of EPO in South Africa.*

Considerations for blood transfusions in patients with HIV related anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comments:

- *Knowing how much of our blood likely goes to persons living with HIV makes this essential to me.*
- *It would be useful for primary healthcare staff to know when to refer patients for blood transfusions to secondary facilities.*

30% of patients living with HIV can have a positive Coombs test. Positive Coombs test makes crossmatching difficult so that only the “least incompatible” blood can be issued. The importance of weighing the risk of transfusing “least incompatible” needs to be considered.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments:

- *I myself used this reference in my Master's but my suspicion is that this not necessarily true in the South African setting - would be very interesting MMed for someone...*
- *Primary healthcare facilities in the Western Cape do not administer blood products.*

4.2 Policies/protocols/standard operating procedures needed as tools

Pre-operative anaemia optimization protocol.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comments:

- *Just as a start: C-section is likely one of the most commonly performed procedures in South Africa, peripartum heamorrhage remains in the top 3 leading causes of maternal death - this is a no brainer.*
- *It may be useful for primary healthcare staff to identify anaemia prior to referral to secondary centres for surgery.*

Pre-operative evaluation for bleeding risk.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Intra-operative coagulation assessment.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment: *If you address the above two questions (Pre-operative anaemia optimization and Pre-operative evaluation for bleeding risk,) then this is really not necessary.*

Post-operative assessment of bleeding risk.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment:

If you address the above If you address the above two questions (Pre-operative anaemia optimization and Pre-operative evaluation for bleeding risk,) then this is really not necessary this is really not necessary.

Management of anti-coagulants in the peri-operative period.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Bridging anticoagulation guidelines.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment: *Should not be managed at this level.*

Massive bleeding (general): Massive haemorrhage protocol.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Management of trauma associated haemorrhage.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Blood ordering, blood product indications and blood usage policy.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment: *Transfusions do not generally occur at this level, and I don't think it should. Developing policies and procedures for events that occurs rarely are not necessarily the best use of limited resources.*

Blood conservation approaches.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment: *Too little blood is used in this setting to make this a useful approach.*

Guidelines for when to refer patients to the Haematologist.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment: *I honestly don't see that referral will be directly from primary care to a super-specialist level - I don't see this as being practical.*

Use of point-of-care coagulation testing and interpretation, e.g TEG, ROTEM.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐

Comments:

- *We need to (in my opinion) be practical about this - this technology has no place in the primary care setting where there is generally no access to products such as FFP, platelets and coagulation factors are expensive.*
- *Required if facilities have these devices.*

Point-of-care coagulation testing.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐

Comments:

- *I just don't see this as being practical at these settings.*
- *Assuming including POC INR for warfarin?*

Cardiac surgery associated haemorrhage.

	Essential	Useful	Unnecessary
Secondary healthcare setting	☐	☐	☐

Comment

Discipline specific PBM / transfusion guidelines.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Secondary healthcare setting	☐	☐	☐

Comment

Guidelines for blood ordering at hospitals with no onsite blood banks.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Secondary healthcare setting	☐	☐	☐

Tertiary healthcare setting	☐	☐	☐

Comment

Blood management at hospitals with no onsite blood banks.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Secondary healthcare setting	☐	☐	☐

Tertiary healthcare setting	☐	☐	☐

Comment

How to use point-of-care equipment - Do's and Don'ts.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐

Comment

TEG protocol.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐

Comment

Guidelines for when to refer patients to the Gastroenterologist.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment: *I honestly don't see that referral will be directly from primary care to a super-specialist level - I don't see this as being practical.*

Guidelines for when to refer patients to the Gynaecologist.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Guideline for management of cancer related anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐

Comment

4.3 Tools for a complete care paradigm for women.

Checking iron levels 6 weeks postpartum.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

Guidelines for referral of patients for workup of anaemia.

	Essential	Useful	Unnecessary
Tertiary healthcare setting	☐	☐	☐

Comments

Checking iron and ferritin levels following treatment of anaemia caused by heavy menstrual bleeding.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comments

4.4 Tools for minimizing iatrogenic blood loss

Microsampling / microbleeding (smaller volume blood sample collection) benefits.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting			

**Tertiary healthcare
setting**

☐☐☐☐☐☐

Comment

Avoiding unnecessary repeat laboratory testing.

Essential

Useful

Unnecessary

**Primary healthcare
setting**

☐☐☐

Comment

4.5 Tools for pre-operative, intra-operative and post-operative patient care.

Tools for pre-operative, intra-operative and post-operative patient care in **PRIMARY HEALTHCARE FACILITIES**. Advice on:

Essential

Useful

Unnecessary

Pre-operative
anaemia
optimization

☐☐☐

Management of iron
deficiency anaemia
in surgical patients

☐☐☐

Post-operative
patient care
guidelines

☐☐☐

Surgical
considerations
(haemostasis,
lowering blood
pressure,
normothermia).

☐☐☐

Meticulous
haemostasis and
surgical techniques

☐☐☐

Blood sparing
surgical techniques

☐☐☐

Anaesthetic blood
conserving
strategies

☐☐☐

Vigilant monitoring
and management of
post-operative
bleeding

☐☐☐

Preventing
secondary post-
operative
haemorrhage

☐☐☐

Bleeding assessment
tools

☐☐☐

**Bleeding
management tools**

☐☐☐

**List of
medications and
supplements that
cause bleeding**

☐☐☐

**Screening patients
that are high risk
for bleeding**

☐☐☐

Monitoring patients
on
anticoagulant/anti-
platelet therapy

☐☐☐

Limiting dilutional
coagulopathy -
guidance on
crystalloid use and
dangers of over use

☐☐☐

Use of
tranexamic acid

☐☐☐

Comment

Prescribing pain medication with considerations for bleeding risk e.g. NSAIDS, aspirin, etc.

Essential

Useful

Unnecessary

Primary healthcare
setting

☐☐☐

Comment

Avoid/treat infections promptly.

Essential

Useful

Unnecessary

Primary healthcare
setting

☐☐☐

Tertiary
healthcare setting

☐☐☐

Comment

Indications and contra-indications for intraoperative/ postoperative
autologous blood collection and re-transfusion.

Essential

Useful

Unnecessary

Primary healthcare
setting

☐☐☐

Secondary
healthcare setting

☐☐☐

Tertiary healthcare
setting

☐☐☐

Comment

Use of autologous blood donation.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments:

- Autologous blood donation is of very limited use - would not spend time on this.
- Are you referring to involvement by the blood services in autologous donations for elective surgery or blood salvage techniques? The feasibility/ability of providing mass autologous blood donations by the blood services is questionable. **Comment VR:** This refers to autologous blood donations for elective surgery.

Cell salvage protocols.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐

Comment: Can't do cell salvage without the equipment, which is unlikely to be available outside of tertiary setting, especially not at primary care level.

Videos on cell salvage methodology.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Blood loss formula calculator for predicting blood loss.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Early post-operative feeding versus upper GI haemorrhage prophylaxis.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Comment			

Use of erythropoietin.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐

Comment: *Depends if EPO is realistically readily available.*

Use of aprotinin.

	Essential	Useful	Unnecessary
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments:

- *I understand that aprotinin is no longer widely available*
- *This is a historical drug in reality.*

Comment VR: *This statement has been removed from Round 3 of the survey based on the uncertainty of the availability of aprotinin.*

Optimize cardiac output.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment: *PBM third pillar education.*

Optimize ventilation and oxygenation.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment: *PBM third pillar education.*

Optimize anaemia reserve.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment: *PBM third pillar education.*

Maximize oxygen delivery.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment: *PBM third pillar education.*

Minimize oxygen consumption.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment: *PBM third pillar education.*

4.6 Transfusion decision making tools

Transfusion decision making tools for **PRIMARY HEALTHCARE FACILITIES:**

	Essential	Useful	Unnecessary
Products, services and testing offered by the Blood Services	☐	☐	☐

Comment: *I am happy to go with the consensus of primary healthcare staff being educated about this, even though they would not be prescribing blood products.*

Transfusion risks and hazards

Comment

Cost of blood and
blood products,
including
surcharges/levies

☐☐☐

Comment

**Restrictive
transfusion
thresholds**

☐☐☐

Comment

**Single unit
transfusion focus -
transfuse and
assess strategy**

☐☐☐

Comment

4.7 Tools to assist hospitals in setting up PBM programs

Guidelines for setting up healthcare setting appropriate PBM program.

Essential

Useful

Unnecessary

Primary healthcare
setting

☐☐☐

Comment

Self-audit guidelines and checklists.

Essential

Useful

Unnecessary

Primary healthcare
setting

☐☐☐

Comment

PBM readiness checklists for hospitals to serve as a needs analysis.

Essential

Useful

Unnecessary

Primary healthcare
setting

☐☐☐

Comment

Setting metrics/targets – measures to see if set PBM targets are being met.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment: *The targets should be realistic and achievable.*

Transfusion control measures – control measures for when patients should be transfused to ensure patients are transfused only when clinically necessary.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

PBM checklists for patient history taking e.g. *Has the patient had a full blood count in the last six weeks, has the patient had an iron study, does the patient have the following symptoms, did the patient bleed intraoperatively? How much do you think the patient bleed? Postoperative bleeding?*

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Easy access templates for hospitals to write their PBM related protocols.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Templates/checklists to identify bleeding risk.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Laboratory tools – List of tests to request for bleeding disorders.

	Essential	Useful	Unnecessary
Primary healthcare	☐	☐	☐
Secondary healthcare setting	☐	☐	☐

Comment

Laboratory tools – List of tests for detection of anaemia and when to request what tests.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Laboratory awareness tools - What do elevated and/or decreased test results mean.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting			

Tertiary healthcare setting

☐☐☐☐☐☐

Comment

Guidance on how to set up pre-operative anaemia and bleeding clinic.

Essential

Useful

Unnecessary

Primary healthcare setting

☐☐☐

Comment

Referenced literature providing evidence base for PBM implementation in South Africa, low and middle-income countries and global.

Essential

Useful

Unnecessary

Primary healthcare setting

☐☐☐

Secondary healthcare setting

☐☐☐

Comment

How to set up hospital transfusion committee/blood user committee/PBM committee.

Essential

Useful

Unnecessary

Primary healthcare setting

☐☐☐

Comment

Standing meeting agenda templates for hospital transfusion committee/blood user committee/PBM committee meetings.

Essential

Useful

Unnecessary

Primary healthcare setting

☐☐☐

Secondary healthcare setting

☐☐☐

Tertiary healthcare setting

☐☐☐

Comment

Committee representation guidelines for hospital transfusion committee/blood user committee/PBM committee.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting:	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Standardized blood accountability forms.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Comprehensive informed consent documents for blood transfusion.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Code of conduct for ordering and administering transfusions.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Audit tools (How to carry out an audit e.g. transfusion use, iron reactions, etc).

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Implementing electronic blood ordering systems.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment: *Would spend the resource and energy where the most blood is ordered.*

Guidance on how to implement policies/protocols/guidelines.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

4.8 Other tools.

Blood ordering form should include questions on whether alternate approaches other than transfusion have been considered for the patient.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Blood usage/monitoring dashboard (one could login to a common portal and view blood usage of hospitals).

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Share PBM success stories (local and global).

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐

Tertiary healthcare setting

☐☐☐

Comment

Questions and Answers platform e.g. PBM *WhatsApp* group.

Essential

Useful

Unnecessary

Primary healthcare setting

☐☐☐

Secondary healthcare setting

☐☐☐

Tertiary healthcare setting

☐☐☐

Comment

Information alerts giving updates on changes in clinical practices or changes in protocols/procedures.

Essential

Useful

Unnecessary

Primary healthcare setting

☐☐☐

Secondary healthcare setting

☐☐☐

Tertiary healthcare setting

☐☐☐

Comment

5. How would you rate the importance of the following PBM modalities in PRIMARY, SECONDARY and TERTIARY healthcare facilities respectively in South Africa?

IV iron

Essential

Useful

Unnecessary

Primary healthcare setting

☐☐☐

Comment

Erythropoietin

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Comment			

Intra-operative normovolaemic haemodilution.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐
Comment			

Cell salvage equipment.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Comment			

Optimizing anaemia before elective surgery.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Comment			

Single unit transfusions.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Comment			

Blood accountability forms.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐

Comment: *So little blood is used in the primary setting that I would not focus on this.*

Motivation for blood transfusion.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Point of care testing (POCT) Haematocrit.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment: *Not sure I would make this a priority - POC haematocrit is not generally available, would not change practice just for this.*

POCT INR

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment: *Really cannot support the need for POC INR testing when one can make a clinical diagnosis and manage accordingly until have lab result available.*

POCT Platelet Function

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment: *These are expensive and complex testing, with limited general utility - need to remember we are predominantly a resource constrained setting.*

POCT intra-operative coagulation monitoring (e.g. ROTEM or TEG)

	Essential	Useful	Unnecessary
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment: *These are expensive and complex testing, with limited general utility - need to remember we are predominantly a resource constrained setting.*

6. Toolkit look & feel: Please rate the following options in terms of how the toolkit should be made available for practical access and use.

Essential

Useful

Unnecessary

All-inclusive package including videos, diagrams, lectures/podcasts, policies, procedures, templates, etc.

☐☐☐

Physical/Paper based toolkit with all of the above

☐☐☐

Should be a combination of Digital and Physical

☐☐☐

Should be in a poster format

☐☐☐

There should be a

There should be separate toolkits for public and private sector hospitals

☐☐☐

PBM toolkit specific for nurses

☐☐☐

Comments

SECTION D: PBM education deficiencies and education failures. This section deals with the PBM knowledge deficiencies that need to be addressed amongst the various stakeholder groups, including existing education failures.

7.1 PBM education deficiencies that need to be addressed.

a. Clinical and ethical aspects of PBM

Please rate the importance of addressing the following PBM knowledge deficiencies amongst

NURSES:

Essential

Useful

Unnecessary

Knowledge of haemostasis

☐☐☐

Role of the laboratory in PBM



When to order what
laboratory tests



Understanding
laboratory test
results



Medications that
cause anaemia



Knowledge of blood
and blood products
and their indications



Blood ordering -
when to order what
products



**Blood transfusion
is not the first
choice treatment
for anaemia**



Cost of blood and
blood products



**Ethical aspects of
the use of blood
and
blood products**



**Process for
informed consent**



Medico-legal
implications of
inappropriate blood
transfusions



Medico-legal
implications of
inappropriate
anaemia
management



**HIV related
anaemia
management**

☐
☐
☐

Comment

Cost of testing (various crossmatch types) including out of hours levies/surcharges.

Essential

Useful

Unnecessary

Doctors

☐
☐
☐

Nurses

☐
☐

Comment

Blood wastage - Blood Service and Health Service implications.

Essential

Useful

Unnecessary

Doctors

☐
☐
☐

Nurses

☐
☐

Comment

Ordering blood on a returnable basis (BRB) benefits.

Essential

Useful

Unnecessary

Doctors

☐
☐
☐

Nurses

☐
☐

Comment

Appropriate storage of blood and blood products.

Essential

Useful

Unnecessary

Doctors

☐
☐
☐

Comment

Difference between PBM and Blood Conservation.

Essential

Useful

Unnecessary

Doctors

☐
☐
☐

Nurses

☐
☐

Comment

Making time for patient education and empowerment.

Essential

Useful

Unnecessary

Doctors

☐
☐
☐

Comment

Ethical imperative for PBM.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	

Comment

Clinically appropriate transfusion decision-making (Moving away from knee jerk reactions to a more informed approach).

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Restrictive transfusion thresholds.

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Adequate assessment of patients – Taking proper history is important for PBM.

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Early patient referrals.

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Addressing PBM education deficiencies

b. Blood conservation

Alternate approaches to anaemia management other than transfusion.

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Autologous transfusion options.

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Cell salvage

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐
Comment	☐	☐	☐

Addressing PBM education deficiencies

c. Surgical aspects

Pre-operative, intra-operative and post-operative patient care.

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐
Comment			

Timing of surgery – When to delay surgery.

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐
Comment			

Use of tranexemic acid and other antifibrinolytics.

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐
Comment			

Addressing PBM education deficiencies

d. Oral iron and IV iron

Oral iron and IV iron – When to administer what.

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐
Comment			

Iron metabolism - role of hepcidin in iron absorption.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	☐
Comment			

IV iron - Dosage and administration.

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐
Comment			

IV iron - Preventing and managing adverse events.

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Addressing PBM education deficiencies.

e. Preventing iatrogenic blood loss

Taking smaller volume samples for laboratory testing (micro-sampling/micro-bleeding).

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐

Nurses	☐	☐	

Comment

Avoiding unnecessary repeat testing.

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Benefits of Point-of-care testing (POCT)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

TEG and ROTEM use and interpretation.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐

Nurses	☐	☐	☐

Comment: *This is really not what I would focus on, especially not for nurses.*

Addressing PBM education deficiencies

f. Bleeding and blood loss.

Identifying high risk patients.

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Medications, herbs and supplements that increase bleeding risk.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Nurses	☐	☐	
Comment			

Managing bleeding risk.

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐
Comment			

Managing patients on anticoagulant/anti-platelet therapy.

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐
Comment			

Effects of drug interactions.

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐
Comment			

7.2 Please rate the importance of addressing the following PBM awareness aspects amongst management and administrative stakeholders such as hospital management, medical aids, and finance related stakeholders:

	Essential	Useful	Unnecessary
Management and healthcare leadership roles in creating improved health culture.	☐	☐	☐
Comment			

8. EDUCATION NEEDS FOR PATIENT EMPOWERMENT.

8.1 Please rate the importance of addressing the following PBM awareness needs amongst patients.

	Essential	Useful	Unnecessary
Causes of anaemia	☐	☐	☐
Comment			

Consequences of
anaemia

☐☐☐

Comment

Iron deficiency
anaemia

☐☐☐

Comment

Basics of blood
testing and blood
results

☐☐☐

Comment

General health
awareness and
taking ownership of
health

☐☐☐

Comment

Importance of
seeking medical
guidance from the
right people

Comment

Change mindset of
patients "Doctor
always knows best"
philosophy

☐☐☐

Comment

Options for patients
who refuse blood
transfusions

☐☐☐

Comment

8.2 Approaches to educating and empowering patients.

8.2.1. Please rate the value of the following approaches to aid in creating better awareness of anaemia amongst patients.

	Essential	Useful	Unnecessary
Information campaigns by healthcare workers/healthcare organizations	☐	☐	☐
<i>Comment: Historically this has not had much impact.</i>			

Use of radio power	☐	☐	☐
Comment			
Use of social media	☐	☐	☐
Comment			

Make available language appropriate information booklets for patients	☐	☐	☐
<i>Comment: Nobody reads anymore...</i>			

Patient education and empowerment talks	☐	☐	☐
Comment			

Asking doctors questions about treatment options	☐	☐	☐
Comment			

**Medical aids
serving as a voice
to educate patients**

☐☐☐

Comment

Patients empowering
patients with
information

☐☐☐

Comment

Digital education
app. for patients

☐☐☐

Comment

Videos and posters
in waiting rooms
(primary, secondary
and tertiary
healthcare facilities)

☐☐☐

Comment

**Community
healthcare
workers providing
education in the
respective
communities**

☐☐☐

Comment

Sharing of patient
stories (eventful and
uneventful)

☐☐☐

Comment

Online education
e.g. YouTube type
videos

☐☐☐

Comment

9. Please rate the importance of addressing the following education failures that impact PBM implementation in hospitals in South Africa.

Lack of support from hospital management.

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Linear type medical education culture where education is mainly knowledge or theoretically focused rather than being practical or application focused.

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Lack of PBM education in undergraduate medical education for nurses.

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Lack of education on good clinical transfusion practices in undergraduate medical education.

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Lack of online self-learning PBM learning programs for South Africa.

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Lack of training on how to utilize healthcare resources optimally i.e. practicing in resource constraint settings.

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Interns not attending scheduled PBM related training sessions.

☐

Essential

☐

Useful

☐

Unnecessary

Comment

PBM training to empower nurses is lacking yet they are the 'ears and eyes of doctors.

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Philosophical education approaches - therefore not translated in practice.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Doctors should be taught by doctors, surgeons should be taught by surgeons, nurses be taught by nurses.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

SECTION E: Challenges and barriers to PBM implementation in South Africa and how a PBM toolkit may help with implementation. *This section deals with the need to address existing challenges and barriers that will help to enable PBM implementation in hospitals in South Africa.*

10. Please rate the importance of addressing the following barriers and challenges to PBM implementation in South Africa.

Addressing barriers and challenges to PBM implementation

10.1 Awareness, education and buy-in.

PBM is perceived as overwhelming - it is more work for doctors.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Awareness talks and initiatives attract the same individuals who are usually already on board with PBM. Awareness reach is not wide enough to target and get others on board.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of PBM awareness amongst General Practitioners; yet GP environment is ideal for early diagnosis and correction of anaemia.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Nurses are often excluded from PBM awareness initiatives yet they have a key role to play in PBM.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Community health workers are not educated on PBM; they are ideal partners to educate communities using language and level appropriate for various communities.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of PBM guidance and support for doctors at all levels in hospitals.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Limited access to advisory support from Haematologists in the private and public sector.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of buy-in and support from senior leadership in hierarchical structures within hospitals

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Some specialties not on board with PBM. If you agree, please comment which...

☐ Essential ☐ Useful ☐ Unnecessary

Comments:

- Surgeons
- Surgeons, physicians, GPs
- Anaesthetist, Orthopaedic surgeons, general surgeons, obstetricians
- There are early and late enthusiasts from PBM in all specialties.

Addressing barriers and challenges to PBM implementation

10.2. Culture of practice amongst doctors.

Ego of doctors - making transfusion practice changes difficult.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Doctors chase numbers when it comes to patients' haemoglobin levels.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Focus is still on 'product' rather than 'patient.'

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Transfusion triggers vary amongst clinicians within the same discipline.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Single unit transfusions (transfuse and assess strategy) in non-bleeding patients is not a culture of practice in most settings.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of surgical capability in district hospitals – Patients have to be referred causing delay in treatment.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Understanding of response time required for oral and IV iron to work.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of accountability.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.3 Finance related challenges.

Inadequate budget for laboratory screening tests. Anaemia goes undetected in certain patients at primary healthcare facilities and district hospitals preventing early treatment.

☐ Essential ☐ Useful ☐ Unnecessary

Comment: *I am not sure it is true that the budget is inadequate - if all tests were performed appropriately, the budget may well be sufficient.*

Gatekeeping challenges placing restrictions on ordering of blood tests.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Insufficient funds to purchase Point of care testing devices.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

TEG – expensive to run tests.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Not enough budget to employ more hospital staff. Current staff are already overworked with little motivation to do more than they are already doing.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.4 Capacity - Manpower challenges.

No transfusion practitioners in hospitals.

☐ Essential ☐ Useful ☐ Unnecessary

Comment: *Don't need these - PBM is not a "one person" initiative, in fact, having these positions may result in the rest of the healthcare team not taking responsibility.*

No dedicated PBM nurses in hospitals.

☐ Essential ☐ Useful ☐ Unnecessary

Comment: *Don't need these - PBM is not a "one person" initiative, in fact, having these positions may result in the rest of the healthcare team not taking responsibility.*

No transfusion medicine specialists in hospitals in South Africa.

☐ Essential ☐ Useful ☐ Unnecessary

Comment: *Don't need these - PBM is not a "one person" initiative, in fact, having these positions may result in the rest of the healthcare team not taking responsibility.*

Not enough staff to run pre-operative anaemia clinics.

☐ Essential ☐ Useful ☐ Unnecessary

Comment: *Not sure we need full on pre-op anaemia clinics, can be incorporated into existing clinics.*

No time to review blood accountability forms and monitor blood usage.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Backlog of surgical cases - Cannot delay surgery to optimize anaemia in patients.

☐ Essential ☐ Useful ☐ Unnecessary

Comment: *If there are such a backlog, it should not be a problem to delay specific patients as there are many others to take their place.*

Doctors spending time on administrative tasks due to lack of administrative support in public healthcare sector.

☐ Essential ☐ Useful ☐ Unnecessary

Comment: *Often oral iron can be tolerated if the dose is reduced.*

Addressing barriers and challenges to PBM implementation

10.5 Anaemia burden.

Oral iron, and not blood transfusion should be the first modality for correcting iron deficiency - This is not a common culture of practice especially in hospitalized patients.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Oral iron is not always well tolerated by some patients - more tolerable iron preparations come at a higher cost.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Patients are not educated on how to take oral iron.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Oversampling of patients/unnecessary repeat blood tests contribute to anaemia in hospitalized patients.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Use of smallest size blood collection tube practical for laboratory analysis is not a culture of practice.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Small size tubes are not always available for use in adult wards.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Lack of patient-centered healthcare culture.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Patients not empowered and educated with regards to iron deficiency and the associated consequences.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Addressing challenges and barriers to PBM implementation in South Africa.

Addressing barriers and challenges to PBM implementation

10.6 Logistical challenges.

Patients not referred early enough to allow for anaemia workup and treatment.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

No onsite Pathology laboratory in some public hospitals causing delays in laboratory testing.

☐ Essential

☐ Useful

☐ Unnecessary

Comment: *Laboratory services need to be appropriate for the level and geography of the hospital.*

Delays in receiving laboratory test results in the public sector.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Patients go home before tests results are received, and with no treatment.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Patients travel long distances to tertiary care facilities.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Not enough hospital beds to admit patients while awaiting test results for proper diagnosis and treatment.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Patients return to healthcare facilities in worse off conditions.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Some patients never return for treatment / follow up.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Hospitals not having onsite blood banks - more blood is ordered as a safety measure to prevent transfusion delays.

☐ Essential ☐ Useful ☐ Unnecessary

Comment: *Having a blood bank on site, i.e. improving access to blood is not essential and just makes it easier to transfuse rather than investigate and treat.*

Addressing barriers and challenges to PBM implementation

10.7 Policy challenges.

Not enough policies to guide practices e.g. anaemia, PBM, transfusion. (Please specify where necessary).

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Absence of transfusion focus in the National Core Standards for Health Establishments in South Africa.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of guidelines on creating, changing and reviewing policies.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Fragmented policies – no standard blood transfusion policy in hospitals.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

No specific guidance on PBM in Essential Medicine List guidelines.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lengthy guidelines - Simple stronger policies are needed.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of multidisciplinary collaboration in policy development.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Challenges getting timeous endorsement of policies by department of health at national level.

☐ Essential ☐ Useful ☐ Unnecessary

Comment: *Don't need endorsement at DoH level to implement good practice.*

Challenges getting timeous endorsement of policies by department of health at provincial level.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.8 Infrastructure challenges.

Lack of space and infrastructure to set up anaemia clinics.

☐ Essential ☐ Useful ☐ Unnecessary

Comment: *Don't need separate clinics.*

Absence of and/or dysfunctional computer systems and IT support for access to laboratory results is poor.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Absence of electronic blood ordering systems which can create alerts/warnings preventing unnecessary blood ordering.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Computer systems between hospitals and blood banks are not linked.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.9. Lack of general PBM resources/modalities in hospitals.

Hematinics in primary healthcare facilities not always available.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Blood warmers not available in most hospitals.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of cell salvage equipment.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Consumables for cell salvage devices not available.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Oral iron not readily available.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

IV Iron not readily available.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of comfort with IV iron use.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of validated devices for point of care testing e.g. POCT heamoglobin, haematocrit, INR).

☐ Essential ☐ Useful ☐ Unnecessary

Comment: *The cost and reliability of POCT testing are currently still issues.*

Point-of-care coagulation testing not available in theatres.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Tranexamic acid not available in some hospitals.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Erythropoietin not available in some facilities.

☐ Essential ☐ Useful ☐ Unnecessary

Comment: *Erythropoietin should rather be only prescribed by haematologists and nephrologists.*

Addressing barriers and challenges to PBM implementation

10.10. General challenges.

Lack of hospital monitoring systems for blood usage - Dependence on Blood Services for blood usage data.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

No accountability measures for irrational use of blood and blood products including blood wastage.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of proper informed consent process for transfusion.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Blood user committees either non-existent or not adequately functional.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Time challenges and/or poor commitment from members of blood users committee/hospital transfusion committee.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Blood requisition form does include questions on whether treatment options other than transfusion have been considered for the patient.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Blood requisition form does not ask for reasons why blood is being ordered for the patient.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

General comments and suggestions:

Thank you very much for completing Round 2 of the Delphi survey. I will provide feedback on this round of the survey once all participant responses are submitted and analyzed. I will also communicate the details for Round 3 of the survey. Round 3 (last round) of the Delphi survey will be much shorter. I sincerely appreciate your time and contribution to this study.

LETTER TO DELPHI PANEL - ROUND THREE (*FINAL ROUND*)

Developing a validated framework for a Patient Blood Management (PBM) toolkit appropriate for the South African healthcare context

Dear Doctor/Professor

Thank you once again for your participation in the Delphi process and for the very valuable feedback you provided in Round Two of the survey.

In Round Two of the Delphi, 46% consensus was reached on 230 statements. Consensus was pre-defined according to the literature as the state where 80% of the participants vote on a specific item with the same value on the three-point scale.

Round Three questionnaire includes the statements on which consensus **COULD NOT** be reached in Round Two. In this round, I have included the percentage responses from the Panel in Round Two.

In this round of the Delphi process you are given the opportunity to reconsider your opinion on the statements that remain, taking into account the anonymous feedback provided by your fellow participants. Please note that you are allowed to change your opinion as you see fit. You may therefore indicate a different level of importance to any of the statements, as you consider appropriate.

We are aiming to achieve consensus or stability on as many statements as possible.

Stability has been described as the natural tendency of opinions of experts to centralise.

Stability can be declared when movement of the opinion of the group as a whole remains unchanged.

All sections and statements have been maintained in exactly the same manner as in the first two rounds. Please click on the Survey Monkey link that has been included in the email to access the questionnaire.

Please use the following scale again:

1 = Essential (This criterion must **DEFINITELY BE INCLUDED** in the framework for a PBM toolkit)

2 = Useful (This criterion **CAN BE INCLUDED** in the framework)

3 = Unnecessary (This criterion must **DEFINITELY BE EXCLUDED** from the toolkit)

Please answer all questions in the questionnaire. Do not hesitate to contact me should you have any queries or concerns. The questionnaire in this round should take approximately 30 minutes of your time.

As always, your response remains anonymous and confidential with regards to all other participants. Please complete the survey by the **12 December 2022**. The analysis can only be done once all participants have completed the survey; your cooperation is therefore greatly appreciated.

I would like to sincerely thank you once again for the tremendous effort put into this exercise. I sincerely appreciate your precious time and valuable contribution to this study.

Vanitha Rambiritch (Researcher)
PhD Student - University of Cape Town
Faculty of Health Sciences – Department of Medicine
Head of Learning and Development - KZN
South African National Blood Service.

Delphi Survey Round 3: Developing a validated framework for a Patient Blood Management (PBM) toolkit appropriate for the South African healthcare context.

Welcome and introduction

Thank you for taking the time to participate in Round 3 which is the last round of the Delphi survey.

By proceeding with the survey, it is accepted that you give informed consent to participate in this study. Your time, input and contribution is very much appreciated.

STUDY AIM: To develop a validated framework for a South African healthcare needs focused Patient Blood Management (PBM) toolkit encompassing the essential, cost effective, feasible, evidence based PBM guidance measures to serve as a template to inform the development of a clinical practice PBM toolkit for optimizing the care of patients and avoiding the inappropriate use of blood transfusions.

In professional education, a **‘toolkit’ is defined as a resource that helps a professional improve his or her competence, knowledge or skills.** For the purpose of this study, a PBM toolkit will comprise a host of guidance resources serving as tools to aid clinicians in diagnosing and treating anaemia, and managing bleeding and blood loss in patients. Tools for a PBM toolkit may be in the form of guidelines, standard operating procedures, diagrams, educational material, recorded lectures, posters, videos, case scenarios, information alerts, etc.

Please fill in your details below

Name

You have been selected to participate in this study based on your PBM knowledge and expertise and your active involvement in leading and guiding PBM implementation. Your opinion as a participant is sought on the relative importance of each criterion listed in the survey. Each statement must be evaluated in respect of its importance as an aspect or criterion that must be included in a framework to guide the development of a PBM toolkit appropriate for the South African healthcare environment.

This survey comprises five sections. You are required to rate each statement in every section as either:

Essential: (This criterion must **DEFINITELY BE INCLUDED** in the framework for a PBM toolkit)

Useful: This criterion **CAN BE INCLUDED** in the framework for a PBM toolkit)

Unnecessary: This criterion must **BE EXCLUDED** from the framework for a PBM toolkit)

This second round of the Delphi survey will require 30 - 60 minutes of your time. Thank you for your time and contribution.

Delphi Survey Round 3: Developing a validated framework for a Patient Blood Management (PBM) toolkit appropriate for the South African healthcare context.

The importance of PBM implementation in South Africa and the need for a PBM toolkit.

SECTION A: The importance of PBM implementation in South Africa and the need for a PBM toolkit.

This section deals with the reasons why PBM implementation is important in South Africa and why a PBM toolkit is needed.

1. How would you rate the following reasons for why PBM implementation is important in South Africa

It is a means to avoid and reduce transfusion adverse effects. *(60% of the participants selected ESSENTIAL; and 40% selected USEFUL)*

☐

Essential

☐

Useful

☐

Unnecessary

Comment

It encourages research driven improved clinical practices. *(40% of the participants selected ESSENTIAL; 60% selected USEFUL).*

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Implementation of PBM Pillar One is a good enough start for South Africa *(70% of the participants selected ESSENTIAL; 10% selected USEFUL; 20% UNNECESSARY)*

☐

Essential

☐

Useful

☐

Unnecessary

Comment

SECTION B: Audit and Monitoring of blood usage in hospitals.

This section deals with the need to audit and monitor blood usage in hospitals and how best this should be done.

2.1. Who should monitor the usage of blood products?

	Essential	Useful	Unnecessary
Transfusion practitioner appointed for the hospital. (70% selected <i>ESSENTIAL</i> ; 20% <i>USEFUL</i> ; 10% <i>UNNECESSARY</i>)	☐	☐	☐
Hospital appointed transfusion/ PBM nurse. (50% selected <i>ESSENTIAL</i> ; 50% <i>USEFUL</i>)	☐	☐	☐
Heads of each department. (70% selected <i>ESSENTIAL</i> ; 10% <i>USEFUL</i> ; 20% <i>UNNECESSARY</i>)	☐	☐	☐
Department of Health. (50% selected <i>ESSENTIAL</i> ; 30% <i>USEFUL</i> ; 20% <i>UNNECESSARY</i>)	☐	☐	☐
Comment			

Delphi Survey Round 3: Developing a validated framework for a Patient Blood Management (PBM) toolkit appropriate for the South African healthcare context.

PBM tools appropriate for Primary, Secondary and Tertiary level healthcare facilities.

SECTION C: Guidance resources needed as tools for a PBM toolkit appropriate for primary, secondary and tertiary level hospitals/healthcare facilities respectively in South Africa .

This section deals with selecting the essential, cost-effective, feasible, best practice, evidence based measures and resources as clinical practice tools for a PBM toolkit appropriate for Primary, Secondary and Tertiary level hospitals/healthcare facilities in South Africa.

Please rate the importance of the following as tools for a PBM toolkit appropriate for PRIMARY, SECONADRY and TERTIARY LEVEL hospitals/healthcare facilities respectively.

Tools for a PBM toolkit may be in the form of guidelines, standard operating procedures, diagrams, educational material, recorded lectures, posters, videos, case scenarios, information alerts, etc.)

3.1 ANAEMIA FOCUS TOOLS.

3.1.a. Tools for detection and management of anaemia.

List of drugs that cause anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting (45% ESSENTIAL; 55% USEFUL)	☐	☐	☐
Secondary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐

Comment

3.1.b IV Iron Tools

Please rate the following tools for a PBM toolkit

IV Iron tools for **PRIMARY HEALTHCARE FACILITIES**:

	Essential	Useful	Unnecessary
Demystify IV iron use - Provide scientific basis that argue the myths (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐
Indications for IV iron (70% selected ESSENTIAL; 30% USEFUL)	☐	☐	☐
IV iron: Administration, timing and dosage (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐
IV iron: Preventing and managing adverse events (55% ESSENTIAL; 45% USEFUL)	☐	☐	☐

Comment

Digital forms to simplify the motivation for IV iron to funders.

	Essential	Useful	Unnecessary
Primary healthcare setting (10% ESSENTIAL; 60% USEFUL; 30% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐
Comment			

3.1.c. HIV related anaemia tools.

Malignancies that can lead to anaemia (70% selected ESSENTIAL; 30% USEFUL)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Comment			

Use of recombinant erythropoietin such as erythropoietin alfa.

	Essential	Useful	Unnecessary
Primary healthcare setting (40% USEFUL; 60% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (30% ESSENTIAL; 70% USEFUL)	☐	☐	☐
Comment			

Considerations for blood transfusions in patients with HIV related anaemia (20% selected ESSENTIAL; 70% USEFUL; 10% UNNECESSARY)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Comment			

30% of patients living with HIV can have a positive Coombs test. Positive Coombs test makes crossmatching difficult so that only the “least incompatible” blood can be issued. The importance of weighing the risk of transfusing “least incompatible” needs to be considered.

(20% selected *ESSENTIAL*; 60% *USEFUL*; 20% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

3.2 Policies/protocols/standard operating procedures needed as tools

Pre-operative anaemia optimization protocol. (70% selected *ESSENTIAL*; 20% *USEFUL*; 10% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Intra-operative coagulation assessment. (10% selected *ESSENTIAL*; 30% *USEFUL*; 60% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Post-operative assessment of bleeding risk. (10% selected *ESSENTIAL*; 30% *USEFUL*; 60% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Management of anti-coagulants in the peri-operative period. (10% selected *ESSENTIAL*; 70% *USEFUL*; 20% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Bridging anticoagulation guidelines. (10% selected *ESSENTIAL*; 20% *USEFUL*; 70% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Massive bleeding (general): Massive haemorrhage protocol. (70% selected *ESSENTIAL*; 20% *USEFUL*; 10% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Blood ordering, blood product indications and blood usage policy. (70% selected *ESSENTIAL*; 10% *USEFUL*; 20% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Blood conservation approaches. (50% selected *ESSENTIAL*; 10% *USEFUL*; 40% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Guidelines for when to refer patients to the Haematologist. (40% *ESSENTIAL*; 30% *USEFUL*; 30% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Use of point-of-care coagulation testing and interpretation, e.g TEG, ROTEM. (55% *ESSENTIAL*; 45% *USEFUL*)

	Essential	Useful	Unnecessary
Secondary healthcare setting	☐	☐	☐

Comment

Point-of-care coagulation testing.

	Essential	Useful	Unnecessary
Primary healthcare setting (10% <i>ESSENTIAL</i> ; 40% <i>USEFUL</i> ; 50% <i>UNNECESSARY</i>)	☐	☐	☐

Secondary healthcare setting (50% *ESSENTIAL*; 30% *USEFUL*; 20% *UNNECESSARY*)

☐☐☐

Comment

Discipline specific PBM / transfusion guidelines.

	Essential	Useful	Unnecessary
Primary healthcare setting (20% <i>ESSENTIAL</i> ; 20% <i>USEFUL</i> ; 60% <i>UNNECESSARY</i>)	☐	☐	☐

Secondary healthcare setting (45% *ESSENTIAL*; 55% *USEFUL*)

☐☐☐

Comment

Guidelines for blood ordering at hospitals with no onsite blood banks. (70% *ESSENTIAL*; 20% *USEFUL*; 10% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

TEG protocol. (60% *ESSENTIAL*; 40% *USEFUL*)

	Essential	Useful	Unnecessary
Secondary healthcare setting	☐	☐	☐

Comment

Guidelines for when to refer patients to the Gastroenterologist. (40% *ESSENTIAL*; 50% *USEFUL*; 10% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Guidelines for when to refer patients to the Gynaecologist. (70% *ESSENTIAL*; 30% *USEFUL*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Guideline for management of cancer related anaemia. (20% *ESSENTIAL*; 35% *USEFUL*; 45% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Delphi Survey Round 3: Developing a validated framework for a Patient Blood Management (PBM) toolkit appropriate for the South African healthcare context.

PBM tools for primary, secondary and tertiary healthcare settings .

3.3 Tools for a complete care paradigm for women.

Guidelines for referral of patients for workup of anaemia. (60% selected *ESSENTIAL*; 40% *USEFUL*)

	Essential	Useful	Unnecessary
Tertiary healthcare setting	☐	☐	☐

Comments

3.4 Tools for minimizing iatrogenic blood loss

Microsampling / microbleeding (smaller volume blood sample collection) benefits. (10% *ESSENTIAL*; 60% *USEFUL*; 30% *UNNECESSARY*).

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

3.5 Tools for pre-operative, intra-operative and post-operative patient care. Advice on:

Tools for pre-operative, intra-operative and post-operative patient care in **PRIMARY HEALTHCARE FACILITIES**. Advice on:

	Essential	Useful	Unnecessary
Pre-operative anaemia optimization (60% <i>ESSENTIAL</i> ; 30% <i>USEFUL</i> ; 10% <i>UNNECESSARY</i>)	☐	☐	☐
Management of iron deficiency anaemia in surgical patients (60% <i>ESSENTIAL</i> ; 30% <i>USEFUL</i> ; 10% <i>UNNECESSARY</i>).	☐	☐	☐
Post-operative patient care guidelines (50% <i>ESSENTIAL</i> ; 40% <i>USEFUL</i> ; 10% <i>UNNECESSARY</i>)	☐	☐	☐
Surgical considerations (haemostasis, lowering blood pressure, normothermia). (20% <i>ESSENTIAL</i> ; 20% <i>USEFUL</i> ; 60% <i>UNNECESSARY</i>)	☐	☐	☐

Meticulous haemostasis and surgical techniques <i>(20% ESSENTIAL; 20% USEFUL; 60% UNNECESSARY)</i>	☐	☐	☐
Blood sparing surgical techniques <i>(30% ESSENTIAL; 20% USEFUL; 50% UNNECESSARY)</i>	☐	☐	☐
Anaesthetic blood conserving strategies <i>(20% ESSENTIAL; 35% USEFUL; 45% UNNECESSARY)</i>	☐	☐	☐
Vigilant monitoring and management of post-operative bleeding <i>(50% ESSENTIAL; 20% USEFUL; 30% UNNECESSARY).</i>	☐	☐	☐
Preventing secondary post-operative haemorrhage <i>(50% ESSENTIAL; 30% USEFUL; 20% UNNECESSARY)</i>	☐	☐	☐
Bleeding assessment tools <i>(70% ESSENTIAL; 30% USEFUL)</i>	☐	☐	☐
Monitoring patients on anticoagulant/anti-platelet therapy <i>(60% ESSENTIAL; 40% USEFUL)</i>	☐	☐	☐
Limiting dilutional coagulopathy - guidance on crystalloid use and dangers of over use <i>(70% ESSENTIAL; 30% USEFUL)</i>	☐	☐	☐
Comments			

Indications and contra-indications for intraoperative/ postoperative autologous blood collection and re-transfusion. (45% *ESSENTIAL*; 55% *USEFUL*)

	Essential	Useful	Unnecessary
Secondary healthcare setting	☐	☐	☐

Comment

Use of autologous blood donation.

	Essential	Useful	Unnecessary
Secondary healthcare setting (10% <i>ESSENTIAL</i> ; 60% <i>USEFUL</i> ; 30% <i>UNNECESSARY</i>)	☐	☐	☐

Tertiary healthcare setting (40% *ESSENTIAL*; 50% *USEFUL*; 10% *UNNECESSARY*)

☐☐☐

Comment

Cell salvage protocols.

	Essential	Useful	Unnecessary
Primary healthcare setting (30% <i>USEFUL</i> ; 70% <i>UNNECESSARY</i>)	☐	☐	☐

Secondary healthcare setting
(70% *ESSENTIAL*;
20% *USEFUL*; 10% *UNNECESSARY*)

☐☐☐

Comment

Videos on cell salvage methodology.

	Essential	Useful	Unnecessary
Primary healthcare setting (30% <i>USEFUL</i> ; 70% <i>UNNECESSARY</i>)	☐	☐	☐
Secondary healthcare setting (45% <i>ESSENTIAL</i> ; 45% <i>USEFUL</i> ; 10% <i>UNNECESSARY</i>)	☐	☐	☐
Comment			

Blood loss formula calculator for predicting blood loss.

	Essential	Useful	Unnecessary
Primary healthcare setting (70% <i>USEFUL</i> ; 30% <i>UNNECESSARY</i>)	☐	☐	☐
Secondary healthcare setting (55% <i>ESSENTIAL</i> ; 45% <i>USEFUL</i>)	☐	☐	☐
Tertiary healthcare setting (70% <i>ESSENTIAL</i> ; 30% <i>USEFUL</i>)	☐	☐	☐
Comment			

Early post-operative feeding versus upper GI haemorrhage prophylaxis.

	Essential	Useful	Unnecessary
Primary healthcare setting (45% <i>USEFUL</i> ; 55% <i>UNNECESSARY</i>)	☐	☐	☐
Secondary healthcare setting (70% <i>ESSENTIAL</i> ; 30% <i>USEFUL</i>)	☐	☐	☐
Comment			

Use of erythropoietin.

	Essential	Useful	Unnecessary
Primary healthcare setting (45% <i>USEFUL</i> ; 55% <i>UNNECESSARY</i>)	☐	☐	☐
Secondary healthcare setting (45% <i>ESSENTIAL</i> ; 45% <i>USEFUL</i> ; 10% <i>UNNECESSARY</i>)	☐	☐	☐
Comment			

Optimize cardiac output. (10% *ESSENTIAL*; 70% *USEFUL*; 20% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Comment			

Optimize ventilation and oxygenation. (30% *ESSENTIAL*; 50% *USEFUL*; 20% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Comment			

Optimize anaemia reserve. (45% *ESSENTIAL*; 45% *USEFUL*; 10% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Comment			

Maximize oxygen delivery. (45% *ESSENTIAL*; 45% *USEFUL*; 10% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Comment			

Minimize oxygen consumption. (30% *ESSENTIAL*; 60% *USEFUL*; 10% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

3.6 Transfusion decision making tools

Cost of blood and blood products, including surcharges/levies. (60% *selected ESSENTIAL*; 40% *USEFUL*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

3.7 Tools to assist hospitals in setting up PBM programs

PBM readiness checklists for hospitals to serve as a needs analysis (60% *of the participants selected ESSENTIAL*; 40% *USEFUL*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Setting metrics/targets - measures to see if set PBM targets are being met.(40% *ESSENTIAL*; 60% *USEFUL*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Easy access templates for hospitals to write their PBM related protocols (60% *ESSENTIAL*; 40% *USEFUL*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Templates/checklists to identify bleeding risk. (60% *ESSENTIAL*; 40% *USEFUL*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Laboratory tools - List of tests to request for bleeding disorders. (45% *ESSENTIAL*; 45% *USEFUL*; 10% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Laboratory awareness tools - What do elevated and/or decreased test results mean. (55% *ESSENTIAL*; 45% *USEFUL*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Guidance on how to set up pre-operative anaemia and bleeding clinic (45% *ESSENTIAL*; 35% *USEFUL*; 20% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Referenced literature providing evidence base for PBM implementation in South Africa, low and middle-income countries and global. (55% *ESSENTIAL*; 35% *USEFUL*; 10% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

How to set up hospital transfusion committee/blood user committee/PBM committee (20%

ESSENTIAL; 70% USEFUL; 10% UNNECESSARY)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Standing meeting agenda templates for hospital transfusion committee/blood user committee/PBM committee meetings.

	Essential	Useful	Unnecessary
Secondary healthcare setting (55% <i>ESSENTIAL</i> ; 45% <i>USEFUL</i>)	☐	☐	☐
Tertiary healthcare setting (60% <i>ESSENTIAL</i> ; 40% <i>USEFUL</i>)	☐	☐	☐

Comment

Committee representation guidelines for hospital transfusion committee/blood user committee/PBM committee.

	Essential	Useful	Unnecessary
Secondary healthcare setting (40% <i>ESSENTIAL</i> ; 60% <i>USEFUL</i>)	☐	☐	☐
Tertiary healthcare setting (40% <i>ESSENTIAL</i> ; 60% <i>USEFUL</i>)	☐	☐	☐

Comment

Standardized blood accountability forms (50% *ESSENTIAL*; 50% *USEFUL*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Comprehensive informed consent documents for blood transfusion (70% *ESSENTIAL*; 30% *USEFUL*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Code of conduct for ordering and administering transfusions. (55% *ESSENTIAL*; 45% *USEFUL*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Audit tools (How to carry out an audit e.g. transfusion use, iron reactions, etc).

	Essential	Useful	Unnecessary
Primary healthcare setting (55% <i>ESSENTIAL</i> ; 45% <i>USEFUL</i>)	☐	☐	☐

Secondary healthcare setting (70% *ESSENTIAL*; 30% *USEFUL*)

☐☐☐

Comment

Implementing electronic blood ordering systems.

	Essential	Useful	Unnecessary
Primary healthcare setting (20% <i>ESSENTIAL</i> ; 60% <i>USEFUL</i> ; 20% <i>UNNECESSARY</i>)	☐	☐	☐

Secondary healthcare setting (40% *ESSENTIAL*; 60% *USEFUL*)

☐☐☐

Tertiary healthcare setting (60% *ESSENTIAL*; 40% *USEFUL*)

☐☐☐

Comment

Guidance on how to implement policies/protocols/guidelines.

	Essential	Useful	Unnecessary
Primary healthcare setting (45% ESSENTIAL; 45% USEFUL; 10% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (55% ESSENTIAL; 45% USEFUL)	☐	☐	☐
Tertiary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐

Comment

3.8 Other tools.

Blood ordering form should include questions on whether alternate approaches other than transfusion have been considered for the patient. (40% ESSENTIAL; 60% USEFUL)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Blood usage/monitoring dashboard (one could login to a common portal and view blood usage of hospitals.

	Essential	Useful	Unnecessary
Secondary healthcare setting (40% ESSENTIAL; 60% USEFUL)	☐	☐	☐
Tertiary healthcare setting (45% ESSENTIAL; 55% USEFUL)	☐	☐	☐

Comment

Share PBM success stories (local and global).

	Essential	Useful	Unnecessary
Primary healthcare setting (45% <i>ESSENTIAL</i> ; 55% <i>USEFUL</i>)	☐	☐	☐
Secondary healthcare setting (70% <i>ESSENTIAL</i> ; 30% <i>USEFUL</i>)	☐	☐	☐
Tertiary healthcare setting (70% <i>ESSENTIAL</i> ; 30% <i>USEFUL</i>)	☐	☐	☐

Comment

Questions and Answers platform e.g. PBM *WhatsApp* group.

	Essential	Useful	Unnecessary
Secondary healthcare setting (40% <i>ESSENTIAL</i> ; 60% <i>USEFUL</i>)	☐	☐	☐
Tertiary healthcare setting (45% <i>ESSENTIAL</i> ; 55% <i>USEFUL</i>)	☐	☐	☐

Comment

Information alerts giving updates on changes in clinical practices or changes in protocols/procedures.

	Essential	Useful	Unnecessary
Primary healthcare setting (40% <i>ESSENTIAL</i> ; 60% <i>USEFUL</i>)	☐	☐	☐
Secondary healthcare setting (60% <i>ESSENTIAL</i> ; 40% <i>USEFUL</i>)	☐	☐	☐
Tertiary healthcare setting (60% <i>ESSENTIAL</i> ; 40% <i>USEFUL</i>)	☐	☐	☐

Comment

4. How would you rate the importance of the following PBM modalities in PRIMARY, SECONDARY and TERTIARY healthcare facilities respectively in South Africa?

IV iron (55% *ESSENTIAL*; 45% *USEFUL*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Erythropoietin

	Essential	Useful	Unnecessary
Primary healthcare setting (40% <i>USEFUL</i> ; 60% <i>UNNECESSARY</i>)	☐	☐	☐

Secondary healthcare setting (55% *ESSENTIAL*; 45% *USEFUL*)

☐☐☐

Comment

Intra-operative normovolaemic haemodilution.

	Essential	Useful	Unnecessary
Primary healthcare setting (10% <i>ESSENTIAL</i> ; 30% <i>USEFUL</i> ; 60% <i>UNNECESSARY</i>)	☐	☐	☐

Secondary healthcare setting (55% *ESSENTIAL*; 45% *USEFUL*)

☐☐☐

Tertiary healthcare setting (60% *ESSENTIAL*; 40% *USEFUL*)

☐☐☐

Comment

Cell salvage equipment.

	Essential	Useful	Unnecessary
Primary healthcare setting (40% <i>USEFUL</i> ; 60% <i>UNNECESSARY</i>)	☐	☐	☐
Secondary healthcare setting (70% <i>ESSENTIAL</i> ; 30% <i>USEFUL</i>)	☐	☐	☐
Comment			

Blood accountability forms. (70% *ESSENTIAL*; 20% *USEFUL*; 10% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Comment			

Point of care testing (POCT) Haematocrit.

	Essential	Useful	Unnecessary
Primary healthcare setting (45% <i>ESSENTIAL</i> ; 35% <i>USEFUL</i> ; 20% <i>UNNECESSARY</i>)	☐	☐	☐
Secondary healthcare setting (40% <i>ESSENTIAL</i> ; 50% <i>USEFUL</i> ; 10% <i>UNNECESSARY</i>)	☐	☐	☐
Tertiary healthcare setting (40% <i>ESSENTIAL</i> ; 50% <i>USEFUL</i> ; 10% <i>UNNECESSARY</i>)	☐	☐	☐
Comment			

POCT INR

	Essential	Useful	Unnecessary
Primary healthcare setting (45% ESSENTIAL; 35% USEFUL; 20% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐
Tertiary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐

Comment

POCT Platelet Function

	Essential	Useful	Unnecessary
Primary healthcare setting (10% ESSENTIAL; 30% USEFUL; 60% UNNECESSARY)	☐	☐	☐
Secondary healthcare setting (45% ESSENTIAL; 35% USEFUL; 20% UNNECESSARY)	☐	☐	☐
Tertiary healthcare setting (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐

Comment

POCT intra-operative coagulation monitoring (e.g. ROTEM or TEG)

	Essential	Useful	Unnecessary
Secondary healthcare setting (55% ESSENTIAL; 45% USEFUL)	☐	☐	☐

Comment

5. Toolkit look & feel: Please rate the following options in terms of how the toolkit should be made available for practical access and use.

	Essential	Useful	Unnecessary
All-inclusive package including videos, diagrams, lectures/podcasts, policies, procedures, templates, etc. (30% ESSENTIAL; 70% USEFUL)	☐	☐	☐
There should be separate toolkits for public and private sector hospitals (40% USEFUL; 60% UNNECESSARY)	☐	☐	☐
There should be a PBM toolkit specific for nurses (60% ESSENTIAL; 30% USEFUL; 10% UNNECESSARY)	☐	☐	☐

Comments

Delphi Survey Round 3: Developing a validated framework for a Patient Blood Management (PBM) toolkit appropriate for the South African healthcare context.

PBM education deficiencies and education failures that need to be addressed.

SECTION D: PBM education deficiencies and education failures.

*This section deals with the PBM knowledge deficiencies that need **to be addressed amongst the various stakeholder groups, including existing education failures.***

6.1 PBM education deficiencies that need to be addressed.

a. Clinical and ethical aspects of PBM

Please rate the importance of addressing the following PBM knowledge deficiencies amongst
NURSES:

	Essential	Useful	Unnecessary
Knowledge of haemostasis (55% ESSENTIAL; 45% USEFUL)	☐	☐	☐
Role of the laboratory in PBM (55% ESSENTIAL; 45% USEFUL)	☐	☐	☐
When to order what laboratory tests (60% ESSENTIAL; 40% USEFUL)	☐	☐	☐
Understanding laboratory test results (55% ESSENTIAL; 45% USEFUL)	☐	☐	☐
Medications that cause anaemia (55% ESSENTIAL; 45% USEFUL)	☐	☐	☐
Knowledge of blood and blood products and their indications (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐
Blood ordering - when to order what products (45% ESSENTIAL; 55% USEFUL)	☐	☐	☐
Cost of blood and blood products (55% ESSENTIAL; 45% USEFUL)	☐	☐	☐
Medico-legal implications of inappropriate blood transfusions (60% ESSENTIAL; 40% USEFUL)	☐	☐	☐
Medico-legal implications of inappropriate anaemia management (70% ESSENTIAL; 30% USEFUL)	☐	☐	☐

Comment

Cost of testing (various crossmatch types) including out of hours levies/surcharges. (40% *ESSENTIAL*; 60% *USEFUL*)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Blood wastage - Blood Service and Health Service implications. (60% *ESSENTIAL*; 40% *USEFUL*)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Ordering blood on a returnable basis (BRB) benefits (70% *ESSENTIAL*; 30% *USEFUL*)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Difference between PBM and Blood Conservation. (70% *selected ESSENTIAL*; 30% *selected USEFUL*)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Addressing PBM education deficiencies

b. Blood conservation

Cell salvage. (70% *ESSENTIAL*; 30%)

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐

Comment

Addressing PBM education deficiencies

c. Surgical aspects

Pre-operative, intra-operative and post-operative patient care (70% selected *ESSENTIAL*; 30% *USEFUL*)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Timing of surgery - When to delay surgery (10% selected *ESSENTIAL*; 70% *USEFUL*; 20% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Use of tranexemic acid and other antifibrinolytics (60% selected *ESSENTIAL*; 40% *USEFUL*)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Addressing PBM education deficiencies
d. Oral iron and IV iron

IV iron - Dosage and administration (55% selected *ESSENTIAL*; 45% *USEFUL*)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Addressing PBM education deficiencies.
e. Preventing iatrogenic blood loss

Taking smaller volume samples for laboratory testing (micro-sampling/micro-bleeding). (60% *ESSENTIAL*; 40% *USEFUL*)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Avoiding unnecessary repeat testing (45% selected *ESSENTIAL*; 55% *USEFUL*)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Benefits of Point-of-care testing (POCT). (30% selected *ESSENTIAL*; 70% *USEFUL*)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

TEG and ROTEM use and interpretation. (10% selected *ESSENTIAL*; 70% *USEFUL*; 20% *UNNECESSARY*)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Addressing PBM education deficiencies
f. Bleeding and blood loss.

Identifying high risk patients (60% selected *ESSENTIAL*; 40% *USEFUL*)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Managing bleeding risk. (55% selected *ESSENTIAL*; 45% *USEFUL*)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Delphi Survey Round 3: Developing a validated framework for a Patient Blood Management (PBM) toolkit appropriate for the South African healthcare context.

Patient education and empowerment

7. EDUCATION NEEDS FOR PATIENT EMPOWERMENT.

7.1 Please rate the importance of addressing the following PBM awareness needs amongst patients.

	Essential	Useful	Unnecessary
Causes of anaemia (60% <i>ESSENTIAL</i> ; 40% <i>USEFUL</i>)	☐	☐	☐
Comment			
Basics of blood testing and blood results (20% <i>ESSENTIAL</i> ; 70% <i>USEFUL</i> ; 10% <i>UNNECESSARY</i>)	☐	☐	☐
Comment			

7.2 Approaches to educating and empowering patients.

7.2.1. Please rate the value of the following approaches to aid in creating better awareness of anaemia amongst patients.

	Essential	Useful	Unnecessary
Information campaigns by healthcare workers/healthcare organizations (45% <i>ESSENTIAL</i> ; 55% <i>USEFUL</i>)	☐	☐	☐
Comment			
Use of social media (70% <i>ESSENTIAL</i> ; 30% <i>USEFUL</i>)	☐	☐	☐
Comment			
Make available language appropriate information booklets for patients (70% <i>ESSENTIAL</i> ; 30% <i>USEFUL</i>)	☐	☐	☐
Comment			

Patient education
and empowerment
talks (40%
ESSENTIAL; 60%
USEFUL)

☐☐☐

Comment

Patients empowering
patients with
information (70%
ESSENTIAL; 30%
USEFUL)

☐☐☐

Comment

Digital education
app. for patients
(55% *ESSENTIAL*;
45% *USEFUL*)

☐☐☐

Comment

Videos and posters
in waiting rooms
(primary, secondary
and tertiary
healthcare facilities)
(70% *ESSENTIAL*;
30% *USEFUL*)

☐☐☐

Comment

Sharing of patient
stories (eventful and
uneventful) (55%
ESSENTIAL; 45%
USEFUL)

☐☐☐

Comment

Online education
e.g. YouTube type
videos (40%
ESSENTIAL; 60%
USEFUL)

☐☐☐

Comment

8. Please rate the importance of addressing the following education failures that impact PBM implementation in hospitals in South Africa.

PBM training to empower nurses is lacking yet they are the 'ears and eyes of doctors.' (70% ESSENTIAL; 20% USEFUL; 10% UNNECESSARY)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Philosophical education approaches - therefore not translated in practice (45% ESSENTIAL; 35% USEFUL; 20% UNNECESSARY)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Delphi Survey Round 3: Developing a validated framework for a Patient Blood Management (PBM) toolkit appropriate for the South African healthcare context.

Addressing challenges and barriers to PBM implementation in South Africa.

SECTION E: Challenges and barriers to PBM implementation in South Africa and how a PBM toolkit may help with implementation.

This section deals with the need to address existing challenges and barriers that will help to enable PBM implementation in hospitals in South Africa.

9. Please rate the importance of addressing the following barriers and challenges to PBM implementation in South Africa.

Addressing barriers and challenges to PBM implementation

9.1 Awareness, education and buy-in.

PBM is perceived as overwhelming - it is more work for doctors (30% selected ESSENTIAL; 60% selected USEFUL; 10% UNNECESSARY)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Awareness talks and initiatives attract the same individuals who are usually already on board with PBM. Awareness reach is not wide enough to target and get others on board. (70% selected ESSENTIAL; 30% selected USEFUL)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of PBM guidance and support for doctors at all levels in hospitals. (40% ESSENTIAL; 60% USEFUL)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Limited access to advisory support from Haematologists in the private and public sector (35% ESSENTIAL; 55% USEFUL; 10% UNNECESSARY)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Some specialties not on board with PBM. If you agree, please comment which... (45% ESSENTIAL; 55% USEFUL)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation
9.2. Culture of practice amongst doctors.

Focus is still on 'product' rather than 'patient.' (60% ESSENTIAL; 40% USEFUL)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Transfusion triggers vary amongst clinicians within the same discipline. (70% ESSENTIAL; 30% USEFUL)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation
9.3 Finance related challenges.

Inadequate budget for laboratory screening tests. Anaemia goes undetected in certain patients at primary healthcare facilities and district hospitals preventing early treatment. (70% ESSENTIAL; 30% USEFUL)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Gatekeeping challenges placing restrictions on ordering of blood tests. (45% *ESSENTIAL* ; 55% *USEFUL*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Insufficient funds to purchase Point of care testing devices. (60% *ESSENTIAL*; 40% *USEFUL*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Not enough budget to employ more hospital staff. Current staff are already overworked with little motivation to do more than they are already doing. (70% *ESSENTIAL*; 20% *USEFUL*; 10% *UNNECESSARY*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation
9.4 Capacity - Manpower challenges.

No transfusion practitioners in hospitals. (45% *ESSENTIAL*; 35% *USEFUL*; 20% *UNNECESSARY*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

No dedicated PBM nurses in hospitals (50% of the participants selected *ESSENTIAL*; 30% selected *USEFUL*; 20% *UNNECESSARY*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

No transfusion medicine specialists in hospitals in South Africa. (45% *ESSENTIAL*; 35% *USEFUL*; 20% *UNNECESSARY*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Not enough staff to run pre-operative anaemia clinics. (60% ESSENTIAL; 40% USEFUL)

☐ Essential

☐ Useful

☐ Unnecessary

Comment

No time to review blood accountability forms and monitor blood usage. (55% ESSENTIAL; 35% USEFUL; 10% UNNECESSARY)

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Backlog of surgical cases - Cannot delay surgery to optimize anaemia in patients. (60% ESSENTIAL; 40% USEFUL)

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Doctors spending time on administrative tasks due to lack of administrative support in public healthcare sector. (40% ESSENTIAL; 60% USEFUL)

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

9.5 Anaemia burden.

Oral iron is not always well tolerated by some patients - more tolerable iron preparations come at a higher cost. (70% ESSENTIAL; 30% USEFUL)

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Oversampling of patients/unnecessary repeat blood tests contribute to anaemia in hospitalized patients. (70% ESSENTIAL; 30% USEFUL)

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Use of smallest size blood collection tube practical for laboratory analysis is not a culture of practice. (70% *ESSENTIAL*; 30% *USEFUL*)

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Delphi Survey Round 3: Developing a validated framework for a Patient Blood Management (PBM) toolkit appropriate for the South African healthcare context.

Addressing challenges and barriers to PBM implementation in South Africa.

Addressing barriers and challenges to PBM implementation

9.6 Logistical challenges.

No onsite Pathology laboratory in some public hospitals causing delays in laboratory testing.

(45% *ESSENTIAL*; 55% *USEFUL*)

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Delays in receiving laboratory test results in the public sector. (45% *ESSENTIAL*; 55% *USEFUL*)

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Not enough hospital beds to admit patients while awaiting test results for proper diagnosis and treatment. (55% *ESSENTIAL*; 45% *USEFUL*)

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Patients return to healthcare facilities in worse off conditions. (60% *ESSENTIAL*; 40% *USEFUL*)

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Some patients never return for treatment / follow up. (70% ESSENTIAL; 30% USEFUL)

- ☐ Essential
- ☐ Useful
- ☐ Unnecessary

Comment

Hospitals not having onsite blood banks - more blood is ordered as a safety measure to prevent transfusion delays. (55% ESSENTIAL; 45% USEFUL)

- ☐ Essential
- ☐ Useful
- ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation
9.7 Policy challenges.

Absence of transfusion focus in the National Core Standards for Health Establishments in South Africa. (60% ESSENTIAL; 40% USEFUL)

- ☐ Essential
- ☐ Useful
- ☐ Unnecessary

Comment

Lack of guidelines on creating, changing and reviewing policies. (30% ESSENTIAL; 70% USEFUL)

- ☐ Essential
- ☐ Useful
- ☐ Unnecessary

Comment

Lack of multidisciplinary collaboration in policy development. (70% ESSENTIAL; 20% USEFUL; 10% UNNECESSARY)

- ☐ Essential
- ☐ Useful
- ☐ Unnecessary

Comment

Challenges getting timeous endorsement of policies by department of health at national level. (70% ESSENTIAL; 30% USEFUL)

- ☐ Essential
- ☐ Useful
- ☐ Unnecessary

Comment

Challenges getting timeous endorsement of policies by department of health at provincial level. (70% *ESSENTIAL*; 30% *USEFUL*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation
9.8 Infrastructure challenges.

Lack of space and infrastructure to set up anaemia clinics. (30% *ESSENTIAL*; 70% *USEFUL*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Absence of and/or dysfunctional computer systems and IT support for access to laboratory results is poor. (60% *ESSENTIAL*; 30% *USEFUL*; 10% *UNNECESSARY*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Absence of electronic blood ordering systems which can create alerts/warnings preventing unnecessary blood ordering. (60% *ESSENTIAL*; 40% *USEFUL*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Computer systems between hospitals and blood banks are not linked. (55% *ESSENTIAL*; 45% *USEFUL*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation
9.9. Lack of general PBM resources/modalities in hospitals.

Hematinics in primary healthcare facilities not always available. (45% *ESSENTIAL*; 55% *USEFUL*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Blood warmers not available in most hospitals. (35% *ESSENTIAL*; 55% *selected USEFUL*; 10% *UNNECESSARY*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Oral iron not readily available. (70% *ESSENTIAL*; 20% *USEFUL*; 10% *UNNECESSARY*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of validated devices for point of care testing e.g. POCT heamoglobin, haematocrit, INR). (30% *ESSENTIAL*; 70% *USEFUL*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Point-of-care coagulation testing not available in theatres. (45% *ESSENTIAL*; 55% *USEFUL*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Tranexamic acid not available in some hospitals. (60% *ESSENTIAL*; 40% *USEFUL*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Erythropoietin not available in some facilities. (20% *ESSENTIAL*; 70% *USEFUL*; 10% *UNNECESSARY*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation
9.10. General challenges.

Lack of hospital monitoring systems for blood usage - Dependence on Blood Services for blood usage data. (70% *ESSENTIAL*; 30% selected *USEFUL*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Blood user committees either non-existent or not adequately functional. (70% *ESSENTIAL*; 30% *USEFUL*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Blood requisition form does include questions on whether treatment options other than transfusion have been considered for the patient. (30% *ESSENTIAL*; 70% *USEFUL*)

☐ Essential ☐ Useful ☐ Unnecessary

Comment

General comments and suggestions

Thank you very much for completing Round 3 of the Delphi survey. I will provide feedback on this round of the survey once all participant responses are submitted and analyzed. I would like to thank you once again for the tremendous effort put into this exercise. I sincerely appreciate your precious time and valuable contribution to this study.

Appendix G3

FEEDBACK ON DELPHI SURVEY ROUND THREE

Developing a validated framework for a Patient Blood Management (PBM) toolkit appropriate for the South African healthcare context

Dear Doctor/Professor

Thank you once again for your participation in all three rounds of the Delphi survey.

According to Larson and Wissman consensus is reached where 80% of the participants indicate a similar value (to a specific item) as their choice. Stability refers to the consistency of responses between successive rounds of a Delphi study.

After Round Three, consensus was reached on 694 of the final 787 statements in the questionnaire, giving a 88.1% overall consensus. Stability was reached on 85 statements, giving a 10.8% overall stability. The total number of statements where either consensus or stability was reached is therefore 779 out of 787 (98.9%).

The findings of Round three of the Delphi survey are shown below. As in the previous rounds, the statements showing consensus are presented in GREEN.

Statements showing stability are presented in BLACK and statements where neither consensus nor stability were reached are presented in BLUE.

I thank you once again for your valuable time and expert contribution.

Kind regards

Vanitha Rambiritch

Welcome and introduction

Thank you for taking the time to participate in Round 2 of the Delphi survey.

By proceeding with the survey, it is accepted that you give informed consent to participate in this study. Your time, input and contribution is very much appreciated.

STUDY AIM: To develop a validated framework for a South African healthcare needs focused Patient Blood Management (PBM) toolkit encompassing the essential, cost effective, feasible, evidence based PBM guidance measures to serve as a template to inform the development of a clinical practice PBM toolkit for optimizing the care of patients and avoiding the inappropriate use of blood transfusions.

In professional education, a **‘toolkit’ is defined as a resource that helps a professional improve his or her competence, knowledge or skills.** For the purpose of this study, a PBM toolkit will comprise a host of guidance resources serving as tools to aid clinicians in diagnosing and treating anaemia, and managing bleeding and blood loss in patients. Tools for a PBM toolkit may be in the form of guidelines, standard operating procedures, diagrams, educational material, recorded lectures, posters, videos, case scenarios, information alerts, etc.

Please fill in your details below

Name

You have been selected to participate in this study based on your PBM knowledge and expertise and your active involvement in leading and guiding PBM implementation. Your opinion as a participant is sought on the relative importance of each criterion listed in the survey. Each statement must be evaluated in respect of its importance as an aspect or criterion that must be included in a framework to guide the development of a PBM toolkit appropriate for the South African healthcare environment.

This survey comprises five sections. You are required to rate each statement in every section as either:

Essential: (This criterion must **DEFINITELY BE INCLUDED** in the framework for a PBM toolkit)

Useful: This criterion **CAN BE INCLUDED** in the framework for a PBM toolkit)

Unnecessary: This criterion must **BE EXCLUDED** from the framework for a PBM toolkit)

This second round of the Delphi survey will require 30 - 60 minutes of your time. Thank you for your time and contribution.

SECTION A: The importance of PBM implementation in South Africa and the need for a PBM toolkit.

This section deals with the reasons why PBM implementation is important in South Africa and why a PBM toolkit is needed.

1. How would you rate the following reasons for why PBM implementation is important in South Africa

It is a means to avoid and reduce transfusion adverse effects.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

It encourages research driven improved clinical practices.

☐ Essential

☐ Useful

☐ Unnecessary

Comment

Implementation of PBM Pillar One is a good enough start for South Africa.

☐ Essential

☐ Useful

☐ Unnecessary

Comment: All pillars should be implemented equally. The statement gives the impression that pillar one is adequate.

SECTION B: Audit and Monitoring of blood usage in hospitals.

This section deals with the need to audit and monitor blood usage in hospitals and how best this should be done.

2.1 Who should monitor the usage of blood products?

Essential

Useful

Unnecessary

Transfusion practitioner appointed for the hospital.

☐

☐

☐

Hospital appointed transfusion/ PBM nurse.

☐

☐

☐

Heads of each department.

☐

☐

☐

Department of Health.

☐

☐

☐

Comment

PBM tools appropriate for Primary, Secondary and Tertiary level healthcare Facilities.

SECTION C: Guidance resources needed as tools for a PBM toolkit appropriate for primary, secondary and tertiary level hospitals/healthcare facilities respectively in South Africa.

This section deals with selecting the essential, cost-effective, feasible, best practice, evidence based measures and resources as clinical practice tools for a PBM toolkit appropriate for Primary, Secondary and Tertiary level hospitals/healthcare facilities in South Africa.

Please rate the importance of the following as tools for a PBM toolkit appropriate for PRIMARY, SECONADRY and TERTIARY LEVEL hospitals/healthcare facilities respectively.

Tools for a PBM toolkit may be in the form of guidelines, standard operating procedures, diagrams, educational material, recorded lectures, posters, videos, case scenarios, information alerts, etc.)

3.1 ANAEMIA FOCUS TOOLS.

3.1a. Tools for detection and management of anaemia.

List of drugs that cause anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting:	☐	☐	☐
Comment			

3.1b IV Iron Tools

Please rate the following tools for a PBM toolkit

IV Iron tools for PRIMARY HEALTHCARE FACILITIES:

	Essential	Useful	Unnecessary
Demystify IV iron use – Provide scientific basis that argue the myths	☐	☐	☐
Indications for IV iron	☐	☐	☐
IV iron: Administration, timing and dosage	☐	☐	☐
Preventing and managing Adverse events	☐	☐	☐

Comments: *Perhaps IV iron can be given to pregnant women in a primary healthcare setting when appropriate?*

Digital forms to simplify the motivation for IV iron to funders.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐

3.1c. HIV related anaemia tools.

Malignancies that can lead to anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Use of recombinant erythropoietin such as erythropoietin alfa.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐

Comment: Recombinant erythropoietin is usually only available in Haematology and Nephrology units.

Considerations for blood transfusions in patients with HIV related anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

30% of patients living with HIV can have a positive Coombs test. Positive Coombs test makes crossmatching difficult so that only the “least incompatible” blood can be issued. The importance of weighing the risk of transfusing “least incompatible” needs to be considered.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

4.1 Policies/protocols/standard operating procedures needed as tools

Pre-operative anaemia optimization protocol.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Comment			

Intra-operative coagulation assessment.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Comment			

Post-operative assessment of bleeding risk.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Comment			

Management of anti-coagulants in the peri-operative period.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Comment			

Bridging anticoagulation guidelines.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Comment			

Massive bleeding (general): Massive haemorrhage protocol.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment: *The equipment, drugs and blood products required for such a protocol are not available in the primary setting - the management in the primary setting does not require a full protocol.*

Blood ordering, blood product indications and blood usage policy.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Comment			

Blood conservation approaches.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment: *The primary care setting does not use enough blood to make this a priority.*

Guidelines for when to refer patients to the Haematologist.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Use of point-of-care coagulation testing and interpretation, e.g TEG, ROTEM.

	Essential	Useful	Unnecessary
Secondary healthcare setting	☐	☐	☐

Comments:

- *The 2008 WHO Maputo Declaration on Strengthening of Laboratory Systems emphasizes that validated instruments should be used, for which there is reliable service agreement, and for which reagents can be reliably supplied.*
- *It is not even routinely recommended for all forms or massive haemorrhage. There are other more important priorities.*

Point-of-care coagulation testing.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Secondary healthcare setting

Comment: *The 2008 WHO Maputo Declaration on Strengthening of Laboratory Systems emphasizes that validated instruments should be used, for which there is reliable service agreement, and for which reagents can be reliably supplied.*

Discipline specific PBM / transfusion guidelines.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Secondary healthcare setting

Comment

Guidelines for blood ordering at hospitals with no onsite blood banks.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

TEG protocol.

	Essential	Useful	Unnecessary
Secondary healthcare setting	☐	☐	☐

Comment

Guidelines for when to refer patients to the Gastroenterologist.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Guidelines for when to refer patients to the Gynaecologist.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Guideline for management of cancer related anaemia.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

4.2 Tools for a complete care paradigm for women.

Guidelines for referral of patients for workup of anaemia.

	Essential	Useful	Unnecessary
Tertiary healthcare setting	☐	☐	☐

Comment: Even at CHBH, it was clear that even in the specialist units, anaemia workup was not performed adequately.

4.3 Tools for minimizing iatrogenic blood loss

Micro sampling / micro bleeding (smaller volume blood sample collection) benefits.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment: *I suspect the volume of blood drawn in primary healthcare is very little.*

4.4 Tools for pre-operative, intra-operative and post-operative patient care.

Tools for pre-operative, intra-operative and post-operative patient care in **PRIMARY HEALTHCARE FACILITIES**. Advice on:

	Essential	Useful	Unnecessary
Pre-operative anaemia optimization	☐	☐	☐
Management of iron deficiency anaemia in surgical patients	☐	☐	☐
Post-operative patient care guidelines	☐	☐	☐
Surgical considerations (haemostasis, lowering blood pressure, normothermia).	☐	☐	☐
Meticulous haemostasis and surgical techniques	☐	☐	☐
Blood sparing surgical techniques	☐	☐	☐

Anaesthetic
blood
conserving
strategies

☐☐☐

Vigilant monitoring
and management of
post-operative
bleeding

☐☐☐

Preventing
secondary post-
operative
haemorrhage

☐☐☐

Bleeding assessment
tools

☐☐☐

Monitoring patients
on
anticoagulant/anti-
platelet therapy

☐☐☐

Limiting dilutional
coagulopathy -
guidance on
crystalloid use and
dangers of over use

☐☐☐

Comment: *The emphasis in primary healthcare should be that when patients are referred for surgery they should have their haemoglobin checked before referral.*

Indications and contra-indications for intraoperative/ postoperative
autologous blood collection and re-transfusion.

Essential

Useful

Unnecessary

Secondary
healthcare setting

☐☐☐

Comment

Use of autologous blood donation.

	Essential	Useful	Unnecessary
Secondary healthcare setting	☐	☐	☐

Tertiary healthcare setting

☐	☐	☐

Comment: *The logistics of autologous blood donation is extremely difficult to co-ordinate in government hospital where theatre dates and list change constantly.*

Cell salvage protocols.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐

Comments:

- *Cell salvage protocols should be available where there is technology is available and there are trained staff.*
- *I don't know if cell salvage is feasible in secondary setting (but I may be wrong).*

Videos on cell salvage methodology.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐

Comment

Blood loss formula calculator for predicting blood loss.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐

Tertiary healthcare setting	☐	☐	☐

Comment

Early post-operative feeding versus upper GI haemorrhage prophylaxis.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Secondary healthcare setting	☐	☐	☐

Comment

Use of erythropoietin.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Secondary healthcare setting	☐	☐	☐

Comment: *Currently erythropoietin should only be prescribed by doctors who are experienced in its use.*

Optimize cardiac output.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Optimize ventilation and oxygenation.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment: *PBM third pillar education.*

Optimize anaemia reserve.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment: *PBM third pillar education.*

Maximize oxygen delivery.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Minimize oxygen consumption.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

4.5 Transfusion decision making tools

Cost of blood and blood products, including surcharges/levies

Primary healthcare setting	☐	☐	☐

Comment

4.6 Tools to assist hospitals in setting up PBM programs

PBM readiness checklists for hospitals to serve as a needs analysis.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Setting metrics/targets – measures to see if set PBM targets are being met.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment: *Hospital administrators can abuse these metrics when they do not have clinical Insight.*

Easy access templates for hospitals to write their PBM related protocols.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Templates/checklists to identify bleeding risk.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Laboratory tools – List of tests to request for bleeding disorders.

	Essential	Useful	Unnecessary
Primary healthcare	☐	☐	☐

Comment

Laboratory awareness tools - What do elevated and/or decreased test results mean.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Guidance on how to set up pre-operative anaemia and bleeding clinic.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment: Unlikely that primary healthcare will have the resources to set up a pre-op anemia/bleeding clinic.

Referenced literature providing evidence base for PBM implementation in South Africa, low and middle-income countries and global.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

How to set up hospital transfusion committee/blood user committee/PBM committee.

Comment	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Standing meeting agenda templates for hospital transfusion committee/blood user committee/PBM committee meetings.

	Essential	Useful	Unnecessary
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Committee representation guidelines for hospital transfusion committee/blood user committee/PBM committee.

	Essential	Useful	Unnecessary
Secondary healthcare setting;	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Standardized blood accountability forms.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment: *Not sure how much blood is being transfused in Primary setting?*

Comprehensive informed consent documents for blood transfusion.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Code of conduct for ordering and administering transfusions.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

Audit tools (How to carry out an audit e.g. transfusion use, iron reactions, etc).

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Comment			

Implementing electronic blood ordering systems.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- *The hospitals would have to have reliable hospital informations systems and internet access to allow electronic blood ordering.*
- *Need a very robust IT system for this to work. My experience with electronic ordering previously in our setting (tertiary hospital) has been poor.*

Guidance on how to implement policies/protocols/guidelines.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

4.7 Other tools.

Blood ordering form should include questions on whether alternate approaches other than transfusion have been considered for the patient.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment: *Again...not sure how much transfusion happen in primary setting.*

Blood usage/monitoring dashboard (one could login to a common portal and view blood usage of hospitals).

	Essential	Useful	Unnecessary
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment: *The hospitals would have to have reliable hospital information systems and internet access to allow for dashboards. Hopefully this will happen with time.*

Share PBM success stories (local and global).

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comment

Questions and Answers platform e.g. PBM WhatsApp group.

	Essential	Useful	Unnecessary
Secondary healthcare setting	☐	☐	☐

Tertiary healthcare setting

☐☐☐

Comment: *I personally really like these sort of Whatsapp groups, and find them very useful.*

Not sure if everyone does however.

Information alerts giving updates on changes in clinical practices or changes in protocols/procedures.

Essential

Useful

Unnecessary

Primary healthcare setting

☐☐☐

Secondary healthcare setting

☐☐☐

Tertiary healthcare setting

☐☐☐

Comment: *I initially did not mark this as essential, but transfusion medicine and PBM are not on most people's reading lists, so having an alert system would help ensure new evidence gets disseminated.*

5. How would you rate the importance of the following PBM modalities in PRIMARY, SECONDARY and TERTIARY healthcare facilities respectively in South Africa?

IV iron

Essential

Useful

Unnecessary

Primary healthcare setting

☐☐☐

Comment

Erythropoietin

Essential

Useful

Unnecessary

Primary healthcare setting

☐☐☐

Secondary healthcare setting

☐☐☐

Comment

Intra-operative normovolaemic haemodilution.

Essential

Useful

Unnecessary

Primary healthcare setting

☐☐☐

Secondary
healthcare setting

☐☐☐

Tertiary healthcare
setting

☐☐☐

Comment

Point of care (POCT) Haematocrit.

Primary
healthcare setting

☐☐☐

Secondary
healthcare setting

☐☐☐

Tertiary healthcare
setting

☐☐☐

Comments

- *Most South African doctors (unlike those in the USA) grade anaemia in terms of haemoglobin. They do not have the reference ranges for haematocrits (which are very narrow) in the back of their minds. The haematocrit of the same patients differs when it is done on venous blood or fingerpick blood. I would rather support the use of reliable haemoglobin POC instruments like the Hemacue.*
- *Most tertiary hospitals (?secondary as well) have access to blood gas analyzers. Hb is part of that. Additional POCT unnecessary in my view. Tertiary hospitals also have onsite labs...quick access to results possible.*

Cell salvage equipment.

Essential

Useful

Unnecessary

Primary healthcare
setting

☐☐☐

Secondary
healthcare setting

☐☐☐

Comments

- *Cell salvage could be implemented in secondary hospitals where there it could make economic sense and enough patients would benefit from it.*
- *Is cell salvage feasible on secondary level - I don't have enough knowledge about it to be sure.*

Blood accountability forms.

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐

Comment

POCT INR

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting	☐	☐	☐
Tertiary healthcare setting	☐	☐	☐

Comments

- *These instruments would only make economic sense in settings where there are many patients whose warfarin therapy needs to be monitored.*
- *Monitoring of Warfarin is a huge challenge in all settings...optimizing this will lead to less toxicity and bleeding.*

POCT Platelet Function

	Essential	Useful	Unnecessary
Primary healthcare setting	☐	☐	☐
Secondary healthcare setting			
Tertiary healthcare setting	☐	☐	☐

Comment: *These instruments are only designed to (i) screen for Von Willebrand disease, or (ii) monitor antiplatelet therapy. They would give a false impression in other clinical settings.*

POCT intra-operative coagulation monitoring (e.g. ROTEM or TEG)

	Essential	Useful	Unnecessary
Secondary healthcare setting	☐	☐	☐

Comments

- *Choosing Wisely: Do not use viscoelastic testing to determine blood product transfusions in trauma patient resuscitation without an established, institutional treatment algorithm in place.*
- *I don't think that secondary hospitals in public sector can afford this. It is also most useful in complex surgery (e.g liver and cardiac) which occurs in tertiary settings.*

6. Toolkit look & feel:

Please rate the following options in terms of how the toolkit should be made available for practical access and use.

	Essential	Useful	Unnecessary
All-inclusive package including videos, diagrams, lectures/podcasts, policies, procedures, templates, etc.	☐	☐	☐

There should be separate toolkits for public and private sector hospitals	☐	☐	☐

There should be a PBM toolkit specific for nurses	☐	☐	☐

Comment: *The toolkits for nurses should be harmonised with that for doctors. The AABB toolkit only seems to provide lengthy Word documents as a source of information. Infographics with some references would probably be more useful.*

SECTION D: PBM education deficiencies and education failures. *This section deals with the PBM knowledge deficiencies that need to be addressed amongst the various stakeholder groups, including existing education failures.*

7.1 PBM education deficiencies that need to be addressed.

a. Clinical and ethical aspects of PBM

Please rate the importance of addressing the following PBM knowledge deficiencies amongst **NURSES**:

	Essential	Useful	Unnecessary
Knowledge of haemostasis	☐	☐	☐
Role of the laboratory in PBM	☐	☐	☐
When to order what laboratory tests	☐	☐	☐
Understanding laboratory test results	☐	☐	☐
Medications that cause anaemia	☐	☐	☐
Knowledge of blood and blood products and their indications			
Blood ordering - when to order what products	☐	☐	☐
Cost of blood and blood products			
Medico-legal implications of inappropriate blood transfusions	☐	☐	☐
Medico-legal implications of inappropriate anaemia management	☐	☐	☐

Comment: *The information about haemostasis and laboratory tests should be at the appropriate level.*

Cost of testing (various crossmatch types) including out of hours levies/surcharges.

	Essential	Useful	Unnecessary
Nurses	☐	☐	
Comment			

Blood wastage - Blood Service and Health Service implications.

	Essential	Useful	Unnecessary
Nurses	☐	☐	
Comment			

Ordering blood on a returnable basis (BRB) benefits.

	Essential	Useful	Unnecessary
Nurses	☐	☐	
Comment			

Difference between PBM and Blood Conservation.

	Essential	Useful	Unnecessary
Nurses	☐	☐	
Comment			

Addressing PBM education deficiencies

b. Blood conservation

Cell salvage

	Essential	Useful	Unnecessary
Doctors	☐	☐	☐

Comment: *Just keep in mind that cell salvage should be implemented in an economically viable manner.*

Addressing PBM education deficiencies

c. Surgical aspects

Pre-operative, intra-operative and post-operative patient care.

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Timing of surgery – When to delay surgery.

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Use of tranexamic acid and other antifibrinolytics.

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Addressing PBM education deficiencies

d. Oral iron and IV iron

IV iron - Dosage and administration.

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Addressing PBM education deficiencies.

e. Preventing iatrogenic blood loss

Taking smaller volume samples for laboratory testing (micro-sampling/micro-bleeding).

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Avoiding unnecessary repeat testing.

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Benefits of Point-of-care testing (POCT)

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

TEG and ROTEM use and interpretation.

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Addressing PBM education deficiencies

f. Bleeding and blood loss.

Identifying high risk patients.

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

Managing bleeding risk.

	Essential	Useful	Unnecessary
Nurses	☐	☐	☐

Comment

8. EDUCATION NEEDS FOR PATIENT EMPOWERMENT.

8.1 Please rate the importance of addressing the following PBM awareness needs amongst patients.

Essential

Useful

Unnecessary

Causes of anaemia

☐
☐
☐

Comment

Basics of blood
testing and blood
results

☐
☐
☐

Comment

8.2 Approaches to educating and empowering patients.

Please rate the value of the following approaches to aid in creating better awareness of anaemia amongst patients.

Essential

Useful

Unnecessary

Information
campaigns by
healthcare
workers/healthcare
organizations

☐
☐
☐

Comment

Use of social media

☐
☐
☐

Comment

Make available
language
appropriate
Information
booklets for
patients

Comment: *I'm not gonna move on this one - nobody reads anymore - booklet is too much.*

Patient education
and empowerment
talks

☐☐☐

Comment

Patients empowering
patients with
information

☐☐☐

Comment

Digital education
app. for patients

☐☐☐

Comment

Although some patients may lack access to digital platforms, phones with smartphone capabilities are becoming more ubiquitous. Even in poor socioeconomic settings.

Videos and posters
in waiting rooms
(primary, secondary
and tertiary
healthcare facilities)

☐☐☐

Comment

Sharing of patient
stories (eventful and
uneventful)

☐☐☐

Comment

Online education
E.g. YouTube type
videos

☐☐☐

Comment

9. Please rate the importance of addressing the following education failures that impact PBM implementation in hospitals in South Africa.

PBM training to empower nurses is lacking yet they are the 'ears and eyes of doctors.

☐

Essential

☐

Useful

☐

Unnecessary

Comment

Philosophical education approaches - therefore not translated in practice.

☐ Essential ☐ Useful ☐ Unnecessary

Comment: *Education should be tailored to the audience.*

SECTION E: Challenges and barriers to PBM implementation in South Africa and how a PBM toolkit may help with implementation. *This section deals with the need to address existing challenges and barriers that will help to enable PBM implementation in hospitals in South Africa.*

10. Please rate the importance of addressing the following barriers and challenges to PBM implementation in South Africa.

Addressing barriers and challenges to PBM implementation

10.1 Awareness, education and buy-in.

PBM is perceived as overwhelming - it is more work for doctors.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Awareness talks and initiatives attract the same individuals who are usually already on board with PBM. Awareness reach is not wide enough to target and get others on board.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of PBM guidance and support for doctors at all levels in hospitals.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Limited access to advisory support from Haematologists in the private and public sector.

☐ Essential ☐ Useful ☐ Unnecessary

Comment: *Some provinces have more haematologists than other. Some provinces have no haematologists.*

Some specialties not on board with PBM. If you agree, please comment which...

☐ Essential ☐ Useful ☐ Unnecessary

Comments

- *Cardiothoracic surgery, Intensive Care, Internal Medicine.*
- *For those that are not on board, it's probably just a lack of awareness.*
- *Surgeons, Orthopods.*

Addressing barriers and challenges to PBM implementation

10.2. Culture of practice amongst doctors.

Focus is still on 'product' rather than 'patient.'

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Transfusion triggers vary amongst clinicians within the same discipline.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.3 Finance related challenges.

Inadequate budget for laboratory screening tests. Anaemia goes undetected in certain patients at primary healthcare facilities and district hospitals preventing early treatment.

☐ Essential ☐ Useful ☐ Unnecessary

Comments

- *In some primary healthcare hospitals serum ferritin testing is prohibited because it is too "expensive". Yet blood is used freely.*
- *In some secondary/primary settings administrators does not allow request of iron studies.*

Gatekeeping challenges placing restrictions on ordering of blood tests.

☐ Essential ☐ Useful ☐ Unnecessary

Comment: *While gatekeeping is an important tool to limit costs of unnecessary testing, in some instances as the one highlighter above the rules are detrimental to patient care.*

Insufficient funds to purchase Point of care testing devices.

☐ Essential ☐ Useful ☐ Unnecessary

Comment: *The 2008 WHO Maputo Declaration on Strengthening of Laboratory Systems emphasizes that validated instruments should be used, for which there is reliable service agreement, and for which reagents can be reliably supplied.*

Not enough budget to employ more hospital staff. Current staff are already overworked with little motivation to do more than they are already doing.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.4 Capacity - Manpower challenges.

No transfusion practitioners in hospitals.

☐ Essential ☐ Useful ☐ Unnecessary

Comment: *I agree with comment that it is more important to have everyone on board. Having said that, a person dedicated to this would make things much easier.*

No dedicated PBM nurses in hospitals.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

No transfusion medicine specialists in hospitals in South Africa.

☐ Essential ☐ Useful ☐ Unnecessary

Comment: *I don't think that a particular hospital needs a transfusion specialist...more important that all the staff are adequately trained in transfusion practices. A transfusion specialist can play a more central role in a province/district.*

Not enough staff to run pre-operative anaemia clinics.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

No time to review blood accountability forms and monitor blood usage.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Backlog of surgical cases - Cannot delay surgery to optimize anaemia in patients.

☐ Essential ☐ Useful ☐ Unnecessary

Comment: *This will probably vary by institution, but there is some major backlogs in certain tertiary/secondary hospitals in my region. Having said that....delay in surgery may give more time to work up and optimize patients.*

Doctors spending time on administrative tasks due to lack of administrative support in public healthcare sector.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.5 Anaemia burden.

Oral iron is not always well tolerated by some patients - more tolerable iron preparations come at a higher cost.

☐ Essential ☐ Useful ☐ Unnecessary

Comment: *The most important point here is that even the cheapest forms of oral iron can be tolerated in the dose is reduced accordingly.*

Oversampling of patients/unnecessary repeat blood tests contribute to anaemia in hospitalized patients.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Use of smallest size blood collection tube practical for laboratory analysis is not a culture of practice.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.6 Logistical challenges.

No onsite Pathology laboratory in some public hospitals causing delays in laboratory testing.

☐ Essential ☐ Useful ☐ Unnecessary

Comment: *Pathology laboratories and blood banks are expensive to operate. They should be placed strategically.*

Delays in receiving laboratory test results in the public sector.

☐ Essential ☐ Useful ☐ Unnecessary

Comment: *Usually not a problem in tertiary setting (even most secondary that I am aware of)...basic blood results are usually available relatively quickly.*

Not enough hospital beds to admit patients while awaiting test results for proper diagnosis and treatment.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Patients return to healthcare facilities in worse off conditions.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Some patients never return for treatment / follow up.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Hospitals not having onsite blood banks - more blood is ordered as a safety measure to prevent transfusion delays.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.7 Policy challenges.

Absence of transfusion focus in the National Core Standards for Health Establishments in South Africa.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of guidelines on creating, changing and reviewing policies.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of multidisciplinary collaboration in policy development.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Challenges getting timeous endorsement of policies by department of health at national level.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Challenges getting timeous endorsement of policies by department of health at provincial level.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Addressing barriers and challenges to PBM implementation

10.8 Infrastructure challenges.

Lack of space and infrastructure to set up anaemia clinics.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Absence of and/or dysfunctional computer systems and IT support for access to laboratory results is poor.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Absence of electronic blood ordering systems which can create alerts/warnings preventing unnecessary blood ordering.

☐ Essential ☐ Useful ☐ Unnecessary

Comment: *Need a very robust IT system for this to work. Not currently the case in most public sector hospitals.*

Computer systems between hospitals and blood banks are not linked.

☐ Essential ☐ Useful ☐ Unnecessary

Comment: *Exception is lab results systems - available nationwide in public/private.*

Addressing barriers and challenges to PBM implementation

10.9. Lack of general PBM resources/modalities in hospitals.

Hematinics in primary healthcare facilities not always available.

☐ Essential ☐ Useful ☐ Unnecessary

Comments

- *Ferrous sulphate was out of stock in the Northern Cape for a long time.*
- *I don't know for sure, but I don't think this is usually a problem.*

Blood warmers not available in most hospitals.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Oral iron not readily available.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Lack of validated devices for point of care testing e.g. POCT heamoglobin, haematocrit, INR).

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Point-of-care coagulation testing not available in theatres.

☐ Essential ☐ Useful ☐ Unnecessary

Comment: *Depends on the theatre. As mentioned before, this is only really feasible/useful in settings where complex surgery is performed.*

Tranexamic acid not available in some hospitals.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Erythropoietin not available in some facilities.

☐ Essential ☐ Useful ☐ Unnecessary

Comment: *Due to cost, this will probably remain a tertiary (possibly secondary) level item.*

Addressing barriers and challenges to PBM implementation

10.10. General challenges.

Lack of hospital monitoring systems for blood usage - Dependence on Blood Services for blood usage data.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Blood user committees either non-existent or not adequately functional.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

Blood requisition form does include questions on whether treatment options other than transfusion have been considered for the patient.

☐ Essential ☐ Useful ☐ Unnecessary

Comment

General comments and suggestions:

Thank you very much for completing Round 3 of the Delphi survey. I sincerely appreciate your time and contribution to this study.



UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee



Room G50- Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6492

Email: hrec-enquiries@uct.ac.za

Website: www.health.uct.ac.za/fhs/research/humanethics/forms

21 October 2021

HREC REF: 668/2021

Prof V Louw

Division of Clinical Haematology

E-5 -E-Floor NGSH

Email: vernon.louw@uct.ac.za

Student: Vanitha.rambiritch@sanbs.org

Dear Prof Louw

**PROJECT TITLE: DEVELOPING A VALIDATED FRAMEWORK FOR A PATIENT BLOOD MANAGEMENT TOOLKIT APPROPRIATE FOR THE SOUTH AFRICAN HEALTHCARE CONTEXT-
PHD CANDIDATE-VANITHA RAMBIRITCH**

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee (HREC for review.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study, subject to the following: -

1. Adding the UCT HREC contact details and why we can be contacted.
2. Change Health to Human Research.

This approval is subject to strict adherence to the HREC recommendations regarding research involving human participants during COVID -19, dated 17 March 2020; 06 July 2020 & 01 July 2021.

Approval is granted for one year until the 30 October 2022.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.

(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

The HREC acknowledge that the student: Vanitha Rambiritch will also be involved in this study.

Please quote the HREC REF 668/2021 in all your correspondence.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval, where necessary, before the research may occur.

Yours sincerely



PROFESSOR M. BLOCKMAN

CHAIRPERSON, FACULTY OF HEALTH SCIENCES HUMAN RESEARCH ETHICS COMMITTEE

Federal Wide Assurance Number: FWA00001637.

Institutional Review Board (IRB) number: IRB00001938

NHREC-registration number: REC-210208-007

This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use: Good Clinical Practice (ICH GCP), South African Good Clinical Practice Guidelines (DoH 2006), based on the Association of the British Pharmaceutical Industry Guidelines (ABPI), and Declaration of Helsinki (2013) guidelines. The Human Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code Federal Regulation Part 50, 56 and 312.



NPO Number: 049066NPO
NPC Registration No. 2000/026390/08

Head Office or Zone
1 Constantia Boulevard
Constantia Kloof Ext 22, 1709

Postal Address: Private Bag X14, Weltevreden Park, 1715
Tel: 011 761 9000 **Email:** customerservice@sanbs.org.za
www.sanbs.org.za

SOUTH AFRICAN NATIONAL BLOOD SERVICE NPC Human Research Ethics Committee

OHRP Number : IORG0006278
FWA Registration Number : IRB00007553
SA NHREC Registration Number : REC-270606-013

Secretariat: Tel: 011 761 9334

avril.swarts@sanbs.org.za

To : Vanitha Rambiritch

E-mail : Vanitha.rambiritch@sanbs.org.za

Dear Vanitha

DATE OF COMMITTEE MEETING : 17 November 2021
PROJECT TITLE : Developing a validated framework for a Patient Blood Management (PBM) toolkit appropriate for the South African healthcare context

DECISION OF THE COMMITTEE : APPROVED

CLEARANCE CERTIFICATE NUMBER : 2021/-0584

1. Execution of the study must be compliant with applicable guidelines and policies.
2. Any amendment, extension or any other modifications to the protocol must be submitted to this Ethics Committee for approval prior to implementation.
3. The Committee must be informed of any serious adverse event, planned and unplanned termination of the study.
4. A progress report should be submitted yearly for studies longer than a year and a final report at completion of the study for both short term and long-term studies.
5. Kindly refer to the SANBS HREC clearance certificate number on all future correspondence on this study to the HREC secretariat.
6. This approval is valid for 5 years from the date stated above.

COMMITTEE GUIDANCE DOCUMENTS:

- International Conference on Harmonization (ICH) Good Clinical Practices (GCP) Guideline (ICH, 1996), Ethics in Health Research: Principles, Structures and Procedures (SA Department of Health, 2015); Guidelines for Good Practice in the Conduct of Clinical Trials in Human Participants in South Africa (SA Department of Health, 2006); Ethical Principles for Medical Research Involving Human: Declaration of Helsinki (World Medical Association, 2013); Reviewing Clinical trials: A Guide For Ethics Committees (Karlberg and Speers, 2010).

CHAIRPERSON: Prof J.N. Mahlangu

26 November 2021

DATE

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